DRAFT GUIDELINES FOR THE ENVIRONMENTAL IMPACT STUDY OF THE GREAT-WHALE HYDROELECTRIC PROJECT

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APPENDIX A Memorandum of Understanding

1. INTRODUCTION

1.1.0 Foreword

These draft guidelines on the preparation of Hydro-Quebec's environmental and social impact statement for the proposed Great Whale River hydroelectric project are issued on April 30, 1992. The draft guidelines are being issued by four commissions or environmental assessment panels -- the Evaluating Committee, the Kativik Environmental Quality Commission, the Federal Review Committee North of the 55th Parallel, and the Federal Environmental Assessment Review Panel. These bodies, while working independently, co-ordinated and harmonized their efforts in accordance with the Memorandum of Understanding (MOU) signed on January 23, 1992 by the parties concerned (Appendix A). The draft guidelines include all questions addressed to Hydro Quebec by the bodies listed above. Since the issues dealt with in the guidelines do not all fall under the same jurisdiction, each commission or committee shall, in its report, confine itself to the aspects for which it is responsible.

These preliminary draft guidelines are not exhaustive; they outline the minimum work that the Proponent must complete. They provide a framework for the preparation of the environmental impact statement (EIS). It is sole responsability of the Proponent to produce an EIS that is complete - that is, provides sufficient data and analyses to allow expert evaluation of the projected impacts and their consequences.

Public comments and suggestions concerning modifications, corrections or improvements to these guidelines should be submitted in written form on or before June 15, 1992. Final guidelines will be issued on July 15, 1992, and will be binding.

1.2.0 Purpose and objectives of the guidelines

The purpose of this document is to set forth guidelines that the Proponent must follow in the presentation of the impact assessment study of the proposed Great Whale hydroelectric project. The Provincial Review Committee, the Kativik Environmental Quality Commission, the Federal Review Committee North of the 55th parallel, the Federal Review Committee South of the 55th parallel and the Federal Environmental Assessment Review Panel are charged with the mandate to issue directives, evaluate whether the EIS is complete, whether the proposed project is acceptable, and if so under what conditions.

These guidelines are based on the application of sections 22 and 23 of the JBNQA, Chapter II of the Environment Quality Act and the Federal Environmental Assessment and

Review Process Guidelines Order, which presuppose that the Proponent will address both the ecological and social impacts of the proposed project. The Memorandum of Understanding signed on January 23, 1992 by the concerned parties confirms this requirement, Appendix A. The impact assessment study must satisfy all the provisions of the Regulations respecting the environmental and social impact assessment and review procedure applicable to the territory of James Bay and Northern Quebec. The guidelines also incorporate other issues that were raised during public consultations, as well as in the aforementioned MOU.

The "Preliminary Information" provided by the Proponent in October 1991 includes descriptions of the Great Whale hydroelectric installations, transportation and temporary infrastructure, housing sites and the 315 kV collector system needed to transport electricity to the existing distribution system at the La Grande complex.

1.3.0 Organization of the guidelines

These guidelines are organized into Chapters which follow the logic inherent in a proposal to develop a project and to insert the project into an existing environment. The guidelines require the Proponent to justify the proposed project, to describe the biophysical and social environment in the study area, the proposed project and its variants, the changes and impacts resulting from the project proposal, the mitigative measures that the Proponent agrees to undertake, the compensatory measures directed to appropriate persons and agencies where no direct mitigative measures are possible, and the management of the project over time.

The Proponent is asked to provide the justification for the project, including its general rationale, and to evaluate the long-term implications of the project. In justifying the project, the Proponent should present energy demand and supply scenarios in sufficient detail to demonstrate the need for the project within the context of sustainable development. In this regard, the Memorandum of Understanding provides an outline of the issues to be dealt with by the Proponent.

A comprehensive description of the environmental and social milieu within which the project is proposed must be included in order to allow for a thorough evaluation of the impacts. Moreover, the Proponent must explain the history of the project and the relationship between the 1981 impact assessment and the present one. Reference shall be made to alternative project solutions (project alternatives) and to variations of project design (project variants).

The description of the project variants shall include development of the Great Whale River alone and development of the Great Whale and Little Whale Rivers combined. The latter option has two sub-variants : diverting the Little Whale River into the Great Whale River from either a downstream or an upstream point. In both cases, the tributary watersheds of the diversion will be examined in such a way as to include and to exclude the Nastapoka River basin. In addition, the Proponent is asked to justify the location of the airport at Kuujjuarapik/Whapmagoostui, or at a site mid-way between the community and the proposed site of GB-1, Site H, as well as the road infrastructure and choice of corridor in this regard.

It is implied in the Proponent's Notice of Project and in Bulletin 5 that the project would be built within a relatively short period of time - 1993-2000). Changes to this schedule will undoubtedly occur. Insofar as the Proponent maintains that the entire project area is to be used for the optimal generation of hydroelectric energy, changes to the scheduling can be expected to affect this optimum. The Proponent is asked to describe any changes to the sequence and scheduling described in the Notice of Project and in Bulletin 5 and to determine the changes to the environmental and the social impacts as a result of a project variant that is time-based rather than spatially-based. The Proponent must conduct a cost-benefit analysis of these changes to the schedule.

The Proponent shall describe the biophysical and social impacts of the project. The Proponent shall also provide a description of the cumulative impacts occurring within the project's spatial boundaries, as well as those which add to the impacts of other projects such as La Grande. Long-term impacts on the ecosystems of James and Hudson Bay must also be examined. Moreover, the Proponent shall describe the broad ecosystemic impacts of the project, such as those on the boreal forest, the tundra, as well as such considerations as global warming and changes in the biological and cultural diversity.

Mitigative measures with respect to these impacts must then be outlined, residual impacts that cannot be mitigated must be listed, and proposed compensatory measures must follow. Finally, the implementation of a monitoring and long term management system must be described.

Directives within each Chapter are organized so as to ensure that an integrative and dynamic view of the environmental and social impacts are achieved. Specific data with respect to precise questions raised during the scoping exercise in the various communities are also specified. The directives are intended to focus on the most critical issues facing the Proponent. The directives are also organized in such a way as to require the Proponent to respond to specific questions related to the major components of the project and to major sectors of the social, biophysical and economic milieu.

1.4.0 Methodology and data reliability

These guidelines call for an analytical rather than an encyclopedic environmental impact statement, focusing on key issues derived from the scoping sessions.

The Proponent shall specify and justify all sampling methods and statistical processes employed in both the biophysical and social realms.
The reliability and scope of the results, the reproducibility of the results and quality control of the analyses undertaken in a laboratory setting shall be analyzed critically. The Proponent shall also describe the limits of interpretation imposed by lock of data, referring to the existing relevant literature and comparing the results obtained in the study area to studies carried out in similar conditions elsewhere in the world.

The Proponent shall support all analyses, interpretations of results and conclusions with an extensive review of the appropriate literature, providing all references in an approved scientific format and ensuring the availability of all works consulted. The Proponent shall also define all technical terms used in the EIS and include these in a glossary.

All data based on environmental sampling necessarily involve some variability, which must be determined if one wishes to assess the reliability and scope of the data. In the environmental impact statement, the Proponent shall, for all data obtained from environmental sampling, provide a dispersion or variability coefficient (variance, standard deviation, confidence interval, etc.) and indicate the size of the sample used. Similarly, when using mathematical models, the Proponent shall indicate the prototype used, their accuracy and their inherent limits of interpretation.

All temporal and spatial boundaries specific to the Proponent's studies must be justified with respect to traditional land use, administrative criteria, and scientific data bases. The period of analysis must be comparable for each alternative, and should address the period of time over which any variant would have significant beneficial or adverse effects. Appropriate consideration must be given to environmental and social factors that may extend beyond the period of analysis.

Where the Proponent makes use of qualitative criteria to compare different variants and sub-variants, to describe the environment or to assess impacts, each of these criteria shall be defined, their relative importance in relation to each other stated, and the differences between their constituent classes (acceptable vs desirable) indicated. The Proponent shall justify the attribution of a given class to each criterion.

The Proponent shall explain the methodology used to predict the impacts on the biophysical and social environments, in regard to best-case vs worst-case scenarios. All studies used in the prediction of impacts and the organization of data bases must be specified, the original authors identified and the studies made public. All statements that require or that are based on public consultation shall be justified and the sources and methodology defended.

The Proponent must justify the choice of methodologies, and explain and interpret the results in light of current theories, knowledge, and standards in each of the relevant disciplines. In particular, with respect to the assessment of cumulative impacts, the Proponent must review the state of the art of cumulative impact assessment with reference to appropriate literature, and defend the methodology used.

Where data of importance to the prediction of impacts are missing and cannot be collected, the Proponent must evaluate the significance of their absence and must, if appropriate, provide for their collection during the course of the monitoring program. In devising the monitoring program, the Proponent must make explicit reference to the experience acquired through monitoring of the La Grande complex.

In the case where the Proponent is unable to complete the research due to the inaccesibility of data, the Proponent must advise the review committees and the administrators prior to proceeding with further research. The committes reserve the right to conduct or order independent research or counter expertise should they deem additional studies necessary.

1.5.0 Presentation of the impact study

The environmental and social impact statement should not be construed as a series of data inventories interspersed with general comments on the perceived effects of the project. Thorough analysis and evaluation of the perceived impacts on all ecosystems and their concerned interrelationship must be provided.

The study shall present results and conclusions with respect to three distinct and essential analytical processes: the hierarchical organization of information, the justification of a conclusion and overall judgement, and an examination of the capacity of that global assessment to stand the test of time.

In each study, an order must be established amongst all components under examination, in order to allow an assessment of their relative importance and to determine the extent to which the modification of one element is more or less significant than that of another. All the impacts of the project are not equal and some minor impacts on a crucial element may appear to be more significant than major impacts on a marginal element. Choices with respect to these issues must be stated clearly.

The Proponent shall present an analysis of the costs and benefits of the proposed project, including very disparate and unequal elements, such as economic fall off, traditional land use, value of landscapes and natural rivers, etc., and a synthesis of these costs and benefits.

The time frame for the project must also be specified, including the period of time required to evaluate the positive and negative impacts of the project. This prospective test shall be used to verify the accuracy of the final assessment and to ensure that the organization of the information is justified in the foreseeable future - 25, 50, or 100 years.

The Proponent shall provide a concise, integrated and self-sufficient Impact Study, including references to scientific works and the Proponent's sectorial studies. All scientific and sectorial studies must be numbered and dated prior to their submission to the committees for examination. Maps, other than those used for orientation and context, are to be contained in a separate volume. The Impact Study will be supplemented with a series of complementary documents providing technical and scientific support and containing appropriate bibliographic references in the form of scientific articles, quotations, excerpts and offprints.

Relevant tables, graphs, photographs (ground-level, aerial and satellite) and maps drawn to scale are fundamental to the analysis of impacts. Given the remoteness of the area and the difficulty of access, the Proponent shall include visual simulations, renderings and perspectives of critical landscape zones. These shall include, but not be limited to, all major dam sites, tailrace tunnels, major dikes, and the Bienville reservoir. All visual simulations shall illustrate the landscape conditions before and after implementation of the proposed project.

The Proponent shall submit a table of conformity, in an appendix, showing where in the document or in supporting documents each requirement of the guidelines has been satisfied. The EIS shall be published in French and English. Translation in Innuktitut and Cree shall be provided in conformity to the aforementioned MOU.

1.6.0 Consultation

Is it recognized that the traditional knowledge of Native peoples concerning their territory and its natural resources is essential to adequately assess the impacts of development projects in the Northern environment. The impact assessment of the Great Whale project should not be limited to a presentation of land use by Native people, but should also present the perceptions of the Native populations relative to the impacts of the project. The Proponent shall integrate the Native perception of environmental and social impacts into the assessment of the proposed project.

The Proponent has held a number of information meetings in Native communities directly affected by the development of the Great Whale complex. The scope of these information meetings, their main conclusions and the information used in the impact statement resulting from these meetings shall be specified.

The Proponent shall also report on consultations with government bodies, non-governmental organizations and other interest groups, devoting particular attention to research centers with specialized knowledge of the northern environment.

1.7.0 Sustainable development

The Proponent indicates in Bulletin 5 that the hydroelectric resources of the region will be developed according to the concept of sustainable development as defined by the World Commission on Environment and Development (Brundtland Commission).

This presupposes an approach that would:

- conceive of development as a process that ensures lasting availability of resources for future generations while conserving the quality of the natural environment;
- meet the needs and aspirations of local communities including support for self-reliance of aboriginal peoples and communities;
- ensure that the project has lasting equitable and beneficial effects for present and future generations.

In this regard the evaluation of the proposed project, alternatives to it and variants within it, will be based on the specific measures suggested in the directives that follow as well as the broader issues implied in the three above-mentioned criteria.

2. PROJECT JUSTIFICATION

2.1.0 Introduction

Justification of the proposed project involves an assessment of presumed need for and alternative solutions to new sources of energy supply to meet projected energy demands within and beyond the borders of Quebec. Alternatives to the proposed project shall include those specified in section 2.3. Justification also relates to the nature, extent, and distribution of the environmental, economic and social costs and benefits associated with the proposed project.

All major development proposals affect the biophysical and social environment locally, regionally, and globally. All involve elements of risk and uncertainty in the pursuit of the projected benefits and in the management of the costs associated with project development. The allocation of risks and benefits, however, are seldom incurred by the same persons or groups of people, in the same geographic region, or within the same socio-economic or cultural group.

Assuming the Proponent can demonstrate the future need for new and unsatisfied demands for energy, the choice amongst alternative solutions to satisfy the anticipated demand must be shown to conform to the principles of sustainable development to which the Proponent has made a commitment. In this regard, the comparative evaluation of alternative solutions designed to satisfy energy demand including but not limited to programs of energy conservation, the construction of smaller but more numerous dams, or the use of alternative energy sources shall not be limited to direct costs or measures of the unit cost of energy. Comparative evaluation shall include the nature, type and number of direct and indirect jobs that are generated, the projected length of jobs-permanent, short term, and temporary- which groups are most likely to benefit from these jobs, and the likely location where these jobs will occur. The project shall clearly define the relative weights assigned to the social, environmental, economic, and technical aspects of each alternative. Alternatives shall also be evaluated with respect to their relative impacts on the conservation of biological diversity, the preservation of rare and endangered species, their contribution to social and economic equity and the financial risks with respect to all those affected by the proposed project.

In addition, the directives that follow include detailed instructions with respect to six major issues outlines in the Memorandum of Understanding between the concerned parties. These include:

- the demand for additional sources of energy;
- alternative solutions to satisfy the anticipated demand;

- the system planning assumptions in support of these solutions;
- the evaluation of different economic assumptions and the nature of the equipment program that results;
- alternative designs of the project (major project variants);
- the financial and revenue implications of the project

The documentation provided will include all information and material necessary to assure a high standard of expert review, including information on the assumptions, sources, models, methodologies, and experts used in the preparation of this aspect of the impact statement. The Proponent will demonstrate the validity of the data, methods and models used in the studies that support project justification, indicating data sources and providing a critical appraisal of their quality and validity including potential errors; the history and current validity of the hypotheses that support project justification, and the variety of methods and models used to test these hypotheses.

Information is generally sought for two time periods. The analysis period covers the period 1992-2006. The historic period includes the years 1980-1991.

2.2.0 Demand

The need for a new electricity generation project cannot be assessed without examining load forecasting. Currently, the Proponent separately forecasts consumption for residential, commercial, and industrial customers. The Proponent is required to present an analysis of the factors influencing consumption in each sector. The impact of the analysis of any single factor on the final load forecast is generally limited. However, taken as a whole, they have a very large impact on the final forecast.

It is also important to consider how Quebec's need for power could be modified by utility conservation (commonly called demand-side management or DSM) programs. Studies by the Proponent and other utilities indicate that DSM programs could substantially reduce future growth in the production of additional electrical sources. DSM is a source that must be considered together with other generation and purchase resources. The social, economic and environmental implications of current and future high energy use industries versus reduced demand shall also be evaluated with respect to the project justification.

Electricity exports also have a substantial effect on the requirement for new supply. Conditions in the Proponent's principal export markets have undergone significant transformations since the utility export goals were established and the initial export agreements were negotiated. It is vital to fully review the utility's assumptions concerning future export sales.

2.2.1 Load Forecasting (peak power and energy)

In the area of load forecasting (peak power and energy), the Proponent shall provide and analyze the most recent forecasts. The Proponent must provide data on an annual basis for both the analysis period and the historic period; including descriptions of all econometric models and end-use models used to predict energy and capacity demand for each sector (industrial, commercial, residential), the name and description of each model used, the rationale behind the use of each model and the methodology and theoretical basis for the models utilized. An explanation of the input variables and assumptions for each of the sectoral models must also be provided.

The Proponent shall present the most recently available forecasts (prior to demand-side (DSM) management and use of interruptibility provisions) for residential, commercial, industrial, and other sectors. Complete documentation of the forecasts must be provided, including:

- narrative descriptions of all models (including rationale) used to predict energy and capacity demand;

- a list and explanation of input variables and assumptions (including information relating to multiple scenarios, i.e. high, average, or low, and the probability of those scenarios occurring) for each of the sectoral models, including:

    - the Proponent shall identify its competitors and present its views of the impact of price variations on its markets. This information shall be submitted using the elasticity price concept;

    - for each of the sectors (industrial, commercial, residential), the Proponent shall provide information on the penetration and saturation of each major end-use, namely: space heating, water heating, electrical motors, electrolysis, smelting and refining, stream generation, cooling, lighting;

- economic growth estimates (GDP). If those estimates are from a third party, the Proponent shall identify the source. If the estimates are established or adapted by the Proponent, information such as premises (inflation, interest and exchange rates) are to be provided;

- for the commercial sector forecast, description and documentation (including rationale) of explanatory variables selected and input data utilized.

- for the industrial sector forecast:

  - determinants of demand and growth for these industries, with documentation and rationale as to the explanatory variable selected;

  - growth rates of the pulp and paper industry, including an analysis of major categories of output and pulping method, and impacts of Proponent's program to increase the energy intensity of this industry;

  - growth rates of the primary metals industry, including external forecasting sources utilized and a discussion of the timing of new smelting capacity additions;

  - forecasted prices of primary metals (aluminum and magnesium) and other primary products manufactured under risk-sharing agreements;

  - analysis of potential impacts of U.S. trade rulings imposing countervailing duties on Quebec electricity or electricity-intensive products;

  - for any anticipated additional risk-sharing contracts, a discussion of the projected capacity and energy components, and basis of assumptions made.

- demographic variables used in the models;

- expected technological developments (new end-uses and electro-technologies) and their effects on demand;

- for each sector, expected demand attributable to dual-fuel programs;

- appliance and building codes have an impact on the demand for electricity. Given expected changes in technology, what recommendations does the Proponent wish to submit to improve these standards? Using some examples, the Proponent shall demonstrate the efforts of these improvements on demand.

- assumptions concerning weather-sensitive load and climatic variables;
- a discussion of any comparisons made concerning input assumptions and forecast results of other North American utilities;
- the load factor and load duration curve for 1991. A discussion on their expected evolution, including the load factors used and how determined, as well as a discussion on the factors responsible for their changes.
- a discussion of the forecasting methods and models used to assess the effects of uncertainty;
- assumptions concerning any anticipated sales of surplus energy within Quebec over the forecast period.

2.2.2 Exports

In the area of exports, the Proponent shall provide information relating to and analyse in detail present export commitments and anticipated export markets. This will include a discussion of criteria used to determine whether to enter into new export contracts and/or renegotiate existing contracts.

Particular attention is to be paid to the effect of the export commitments on the scheduling of the construction of the proposed project and the construction phase time frame. The Proponent shall analyse the effect of the cancellation of the current firm export commitments on the scheduling of the project.

The Proponent shall address and analyze its export policy and objectives and will provide detailed economic analysis relating to the costs and benefits of such exports.

- assessment of relevant export markets and existing and anticipated export contracts and opportunities, and any scenarios which have been developed regarding export loads;
- discussion of criteria used to determine whether to enter into new export contracts and\or renegotiate existing contracts;
- annual sales (energy and capacity) for any negotiated or anticipated, and expected revenues;

- the Proponent shall explain its policy concerning the sale of surplus energy outside Quebec including anticipated non-firm export sales and purchases;

2.2.3 Demand-Side Management and Conservation

Particular attention shall be paid to the effect of demand side management and conservation on the need for the proposed Great Whale Project and on the scheduling of the construction of such project. A detailed review of demand side management and conservation as an alternative to the proposed project shall also be provided.

2.2.3.1 Objective

The Proponent shall present its DSM policy. A presentation of technical, cost-effective and achievable energy savings shall follow, as well as the criteria used to assess these savings. In addition, the Proponent shall provide information on the impact of planned DSM programs on the demand forecast (including the differences in DSM impacts for high, average, and low demand scenarios). The Proponent shall differentiate DSM in existing and new loads, and include:

- a description of each demand-side management program, annual (for each year of the analysis period) energy and capacity savings, and projected measure lives, by individual program;
- analysis of the potential for DSM and conservation in Quebec.

2.2.3.2 Analysis

The Proponent shall provide the following:

- estimated annual program expenses (including a breakdown into costs borne by the Proponent, program participants, and any other parties - such as other government agencies);
- the basis used by the Proponent in establishing the appropriate level of spending on DSM programs, the proportion of expenses to be borne by various parties, the basis for annual savings estimates;

- estimates regarding technical, cost-effective, and achievable DSM potential, by end-use, sector and demand scenario, and studies forming the basis of such estimates;

- a discussion of the basis for the Proponent's annual DSM targets, and any studies on the possibility of accelerating or otherwise modifying DSM programs to achieve higher levels of savings (e.g., the effect of providing higher incentive levels);

- a description of the economic tests used to evaluate programs; the results of the above tests for all programs proposed by the Proponent, and specifically for those programs evaluated and rejected; input data utilized in evaluating DSM in the above evaluation; and assumptions and derivations concerning avoided costs relating to the various demand-side management programs;

- projected supply curve of demand-side management resources, with expected costs (per kw and kwh for each individual measure);

- estimates of interruptibility including diurnal, seasonal and hydroelectric interruptions.

2.3.0 Solutions

Alternatives to the proposed Great Whale River Project include hydroelectricity (including projects other than Great Whale, mini-dams, intensifying the use of already damned river systems such as La Grande, Manicouagan, St.Lawrence, etc.) thermal (oil, and gas) nuclear, purchases from adjoining areas (including Labrador) as well as from private producers in Quebec, cogeneration and new technologies such as wind and solar.

Another principal alternative solution is demand side management.

Information provided to the review committees must be sufficient to evaluate whether the proposed Great Whale River Project is appropriate and cost effective and whether this project may be delayed. The Proponent shall therefore provide information that will allow the review committees to evaluate the cost, operations and timing for each of the following resources: Quebec hydroelectricity, Labrador hydroelectricity to be purchased by the Proponent, thermal (fossil), nuclear, purchase (including import), cogeneration, and new technologies. The Proponent shall provide the following for each project (broken down by unit where relevant):

- rated capacity (MW)

- projected annual energy output (GWh);
- availability factor;
- load factor;
- annual planned maintenance (weeks);
- project schedules, schedule constraints, and analysis of factors and uncertainties affecting project schedule, completion;
- capital costs (direct overnight costs in $ 1992 - broken down by generation and transmission);
- allowance for funds used during construction (broken down by generation and transmission);
- total in-service cost ($ 1992) at an assumed in-service date allowing comparison with other resources (broken down by generation and transmission);
- fuel types, sources, and estimated costs for thermal plants - fuel costs per gigajoule (or Btu) and heat rates);
- fixed and variable operations and maintenance costs, including assumptions for waste disposal, where relevant;
- description of specific projects and technologies used to generate electricity;
- description of specific pollution control and other environmental protection technologies assumed (as well as assumed emissions factors and other environmental impacts both pre- and post-installation of pollution control equipment);
- transmission losses for capacity and energy;
- expected mitigation and compensation costs;
- any sensitivity analyses performed by the Proponent concerning costs or other factors described above.

Additional requests for information, specific to the various technologies, are outlined in the headings below.

2.3.1 Hydroelectricity (including Great Whale)

- assumptions regarding run-off for each project, bases for these assumptions and affiliated studies;
- assumptions concerning development of smaller hydroelectric resources;
- expansion and rehabilitation of existing hydroelectric facilities.

2.3.2 Thermal (fossil)

- information concerning various fossil generating technologies considered by the Proponent;
- price forecasts for oil, natural gas and other fuels used for electric production.

2.3.3 Purchases (including import)

2.3.3.1 Purchases within Quebec:

- estimates for purchases from in-province non-utility generators, including type of resource, purchase duration, and expected location;
- a discussion of the Proponent's policies with regard to non-utility generators.

2.3.3.2 Purchases from outside the province:

- anticipated size (in energy and capacity) of purchases, provenance, and anticipated duration.
- to the extent affiliated with specific resources, provide information on the type of resources supplying electricity.

2.3.4 Cogeneration

- to the extent possible, identification of sites (if available);
- definition of the overall resource, by industry;

- analysis of steam use by plant, and a linear extrapolation of cogeneration potential;
- estimated supply curve of cogeneration resources;
- anticipated fuel sources.

2.3.5 New technologies

- estimates concerning the cost, potential, and reliability of wind and solar power.

2.4.0 System Planning

The system planning assumptions apply to provisions for reserves, calculations of losses, and the conduct of hydro operations. These are the technical details that the Proponent generates for its everyday operations.

Quantities of electricity, such as the reserve the Proponent has to put aside to meet system emergencies, industrial options, and periods of low precipitation, must be supplied in sufficient detail as these factors are relevant to the understanding of system operations and the costs of options including the design and operation of the proposed Great Whale Project.

The following information on losses, reserves and hydro operations including supporting discussions are required.

2.4.1 Reserves

The reserve analysis should include a review of the basic planning philosophy, reserve standards, and commitments to governments bodies:

- The Proponent's assumptions concerning the required capacity reserve margins (for each year of the analysis period), as well as inclusion of the probability analysis concerning loss of load which establishes overall reserve levels;
- the basis (including any studies and or Northeast Power Coordinating Council or National Electric Reliability Council guidelines) of criteria established for reserve margins;

- analysis of the effect of potential addition of DSM and generating resources on the required reserve margins;
- assumptions concerning the load carrying capabilities of each of the resources; or, alternatively, quantification of the impact of each type of resource on reserve margins;
- identification of operating agreements with neighbouring utilities, as well as Alcan;
- identification of system emergency rules for domestic and export loads.

2.4.2 Losses (defined as a percentage of output at the generator busbar)

for each sector (residential, commercial, industrial), the aggregate risk-sharing contracts (and for individual contracts if available), and export contracts both individual and aggregate, the following information is requested (for both energy and capacity):

- total losses (from the generator busbar to customer meter\delivery point);
- losses for high voltage transmission from the generator busbar to southern Quebec, by diurnal and seasonal loadings;
- losses from southern Quebec high voltage transmission from southern Quebec to the outside Quebec delivery metering point, by diurnal and seasonal loadings.

2.4.3 Hydro Operations

For the Proponent's system (including Churchill Falls):

- explanation and documentation of the forecasted run-off (in TWh) for each of the river basins in which hydroelectric facilities are located;
- historical run-off data for as many years as available for the Great Whale River basin, and analysis of the correlation between run-off in that river basin and in the combined hydroelectric system;
- forecasted run-off (in TWh) for the Great Whale River basin for each year of the analysis period;

- documents, studies, or other materials utilized to determine probability, distributions and other analyses regarding the variability of run-off for the Great Whale River basin and other basins where hydroelectric facilities are located;

- deviation of the release curve for the Great Whale project including hydro optimization studies used in regulating the system.

2.4.4 Critical Assumptions - Reliability Criteria

- estimates of the likelihood of run-off conditions such as those encountered since 1984;

- estimates of the probability of long-term variability from historic run-off norms;

- estimated required energy reserves to hedge against uncertainties related to variable run-off.

2.5.0 Equipment Program

The purpose of the equipment program is to find the most appropriate and acceptable solution to the electricity needs of Quebec. In this regard, the equipment program is to be evaluated across different economic assumptions, considering low, medium, and high scenarios and expressly addressing the uncertainty in forecasting future loads and the operation of future resources.

The previous information concerning demand, the solutions to meet the demand, financial impacts, and the operations of the system are used to determine which options are most cost-effective.

2.5.1 System Integration/system optimization

- the Proponent shall provide documentation on and explanation of its system optimization models and their application to the selection of the equipment program, including actual output operating instructions, and alternative scenarios. To the degree not already specified in these guidelines, the Proponent shall provide any additional information required to reproduce and evaluate the modelling results;

- the Proponent shall provide a detailed impact analysis on the equipment program of the various high, medium, low demand scenarios. Information should be provided for as many years as available, and at least through the year 2010, including (but not necessarily limited) to the following:

    - in-service date for each project - or portion of a project added to the existing system;
    - date for each retirement an existing or new resource;
    - commencement and/or termination dates for each electric purchase agreement.

- For each year of the analysis period:

    - total energy (TWh) and capacity (MW), broken down by firm Quebec, surplus Quebec, firm exports, surplus exports, and energy reserve margin (if applicable);
    - total energy (TWh) and capacity (MW) supply from all sources (broken down by existing sources (as of 1992) of new generation by project, purchases, reservoir drawdown/refilling, spilling, and exceptional operating measures (with full description of measures and effects).

- current reserves.

2.5.2 Classification of projects (base and peak)

- the Proponent shall provide detailed information on the economic classification of projects including financial information pertaining to the construction of discount rates, inflation forecasts, and risk premiums, to the extent that such information differs from or supplements that provided pursuant to 2.7.1 below.

- under a variety of scenarios the Proponent shall (identified above in Section 2.5.1) classify planned resource additions in terms of:

    - real levelized cost \ kwh ($ 1992)
    - in-service cost \ kw capital cost ($ 1992)

- real levelized cost per kw-year ($ 1992)

2.5.3 Cost comparison

- the Proponent shall provide a full rationale for resource additions selected in each scenario, especially in cases where resources are added out of economic order (i.e., more expensive additions in advance of less costly ones);
- the Proponent shall provide information regarding relative costs and benefits of other resources in relation to the proposed Great Whale project.

2.6.0 Design Alternatives

Design variants (including the non-diversion of the Little Whale River) must be evaluated from both an economic and operational perspective.

The economic and operational data for each of the possible design alternatives to the proposed Great Whale River project will be numbered, the costs and timing changes identified, and the electricity production forecasted.

For each design alternative and design variant for the Great Whale project (including diversion of the Little Whale River), the Proponent shall provide the following:

- description and engineering design of project configurations;
- capacity rating (MW) and annual energy output (GWh) for each station within the project, and for the entire project;
- projected capacity factors for each station within the project, and for the entire project;
- the size of each reservoir, (in physical units, and in energy equivalent (TWh)) associated with the project;
- full description and basis for project schedules, including analysis of schedule constraints, and factors and uncertainties affecting project schedules and potential feasibility;

- capital costs (direct overnight costs in $ 1992); allowance for funds used during construction; and total in-service cost ($ 1992) at an assumed in-service date allowing comparison with other resources;
- any sensitivity analyses performed by the Proponent concerning costs;
- detailed analytical comparison of the costs and benefits of each design alternative.

2.7.0 Financial Proforma and Rates Analysis

The financial and revenue implications of the project are an essential part of any project justification. The revenue implications will be necessary to determine their impacts on electricity rates. Some of these studies are currently presented in an abbreviated form in the Development Plan and the General Report. For the purposes of the review process such analyses will be presented in a greater level of detail.

In addition, a detailed review of the financial parameters used by the Proponent will be presented.

2.7.1 Financial parameters:

- most recent version (and any other relied upon by the Environmental Impact Statement (EIS) of Paramètres économiques et énergetiques de planification à long terme. If the financial parameters utilized in the EIS are other than those in Paramètres provide those utilized (including parameters provided in Paramètres and Follow-up of Development Plan; General Report at December 31, 1991 (Table 12)).

2.7.2 Financial forecasts

- for high, low, and average scenarios of demand and run-off, indicate the probability of each scenario occurring and provide the Proponent's financial forecast;
- revenue and GWh sales for the residential sector; commercial sector, industrial sector; risk-sharing contracts; individual export contracts; and total exports);

- information of the type provided in Tables 13 through 16 of the Follow up of Development Plan 1990-1992, Horizon 1999; General Report at December 31, 1991;
- global (aggregate) profitability of risk-sharing contracts.

2.7.3 Review of rate design

- estimates of rates, total revenues, and revenue variability (across scenarios by category of customer;
- analysis of consistency between the volume of sales (TWh) and sales revenues ($) assumed in the financial forecast and the electricity prices assumed in the demand forecast.

3. DESCRIPTION OF THE BIOPHYSICAL AND SOCIAL ENVIRONMENTS

This Chapter is intended to establish the baseline data against which the predictions of biophysical and social impacts of the proposed project (Chapter 4) will be measured (Chapter 5). The objective of this Chapter, therefore, is to characterize the history, evolution and current state of the environment of the study area that would be modified by the proposed project should it be authorized. Directives with respect to the physical, aquatic, upland and wetland components of the environment as well as the social and cultural characteristics of the inhabitants of the region are intended to guide the Proponent in this respect.

Inventories and histories of the flora, fauna, and peoples serve as the essential data that are required to characterize the evolution and dynamic interaction of the ecosystems and societies that inhabit the study area. It is the latter and not the former that shall be emphasized in the Proponent's report. A listing of inventories and studies that have been completed, that are in progress, or that are required prior to project authorization shall be appended to the Proponent's report. Procedures and agreements to avoid conflicts with traditional harvesting activities during the inventory and analysis stage will be outlined in this Appendix.

The boundaries of the study area will vary with the nature of the phenomena being described and analyzed. The migration of aquatic, terrestrial, and aviary species extends the range of biological concern beyond the strict limits of the watersheds and catchment areas of the proposed project. The traditional patterns of hunting, fishing, and trapping along the coastline and inland as well as the transportation of goods and services to and from the region by road and by air further extend the area of concern. The Proponent will carefully define and justify the limits of the study area for the particular set of studies proposed.

In all studies that are reported, the interaction of the biophysical and social - the natural and the cultural - components of the study area are to be stressed. The hypothesis for each of the studies outlined in this Chapter including the organization of the data, analyses, and conclusions must be explained with respect to a thorough review of the literature, experience gathered in the region and previous work and studies completed for the La Grande Complex.

Descriptions and analyses in this Chapter of the Proponent's study must be organized to interact with the descriptions and analyses of the proposed project so that the statement of impacts that follows is clear and coherent.

For each of these items, the impact study should include a statement of current knowledge pertinent to the project, based on a literature review, indicating how this information is used to formulate hypotheses on data collection and on the identification of possible impacts resulting from the proposed project.

3.1.0 Physical environment

3.1.1 Climate

The Great Whale complex is situated in a transitional environment between the boreal forest (Taiga) and the forest tundra. Given the influence of climate on the biophysical environment and human activities, the Proponent shall provide a detailed description of the climate of the Great Whale River, the Little Whale River, and the Nastapoka river basins.

This description of the climate shall include but not be limited to the following:

- the relationships between surface vegetation and regional climatic conditions, with respect to the ecological regions;
- the length of the growing season and the duration of ground frost;
- temperature: average annual temperature, the average temperature in January and July, multi-year variations, etc.;
- total precipitation and snowfall (annual and monthly data) and multi-year variations;
- wind speeds and directions and multi-year variations;
- the influence of evaporation and evapo-transpiration on the hydrologic budget;
- particular climatic conditions observed in the study area. fog hazard zones, microclimates, etc.

The objective of this climatic description is to create a better understanding of prevailing conditions, particularly with regard to the construction and operation of the planned reservoirs and the changes which could result.

3.1.2 Geology

The geological description of the study area shall identify the various geological formations and determine their influence on the environment which they support (for example, acidity of lakes and soil, productivity of plant communities). In addition, the Proponent shall locate and identify known mineral resources and indicate, insofar as is possible, their potential for economic development. This description shall include but not be limited to the following:

- the geology of the study area;
- particular geological and geomorphological phenomena, particularly those which result from isostatic rebound (for example, cuestas);
- the location of existing claims;
- seismic cartography and remote sensing studies covering the past twenty years.

3.1.3 Relief and surface deposits

The drainage basins affected by the hydroelectric complex includes several distinct physiographic units that have resulted from a long geological evolution. The Proponent shall show this evolution clearly in the impact analysis, bringing out the spatial distribution of the resulting land units or morphological and sedimentological units.

The Proponent shall describe the relief of the drainage basins developed and the profile (longitudinal and transversal) of watercourses in order to pinpoint possible sites for diversion of rivers and development of generating stations and reservoirs. This description shall result from the use of clinometric and hypsometric maps. In areas near these sites, the Proponent shall locate and describe surficial deposits in order to identify potential erosion areas and evaluate the availability of construction materials. The availability of borrow pit materials for other infrastructures required by the project (roads, airports, etc) shall also be examined. This shall include but not be limited to the following:

- a description of the topography of the study area;
- a description of surficial deposits and their geographical distribution;

- the areas prone to erosion problems, and other phenomena related to soil dynamics;
- special sites that warrant protection.

The main objective is to determine the importance of surficial deposits to the establishment of vegetation, the risk of erosion and landslides, and the availability of materials for carrying out the project. The Proponent shall also highlight the land units or components which are visually appealing according to the residents of the region and elsewhere, including interesting geological or geomorphological features. Their uniqueness is to be explained wherever they might be submerged or altered as a result of development. The Lake Fagnant floodplain and the banks of the Great Whale River are examples of such units.

The Proponent must go beyond a simple inventory of physiographic units. This must be effectuated on more than a single level, for the areas directly affected by the construction work, such as the reservoirs, and the valleys downstream from the diversions.

3.1.4 Soils and permafrost

The Proponent shall describe the capacity of the environment to support surface vegetation. This shall include but not be limited to the following:

- the order and main groups of soils in the study area;
- a description of the soils: thickness, geographical distribution (as a function of altitude, among other variables), productivity, etc.;
- distribution of soils capable of supporting trees or shrubs;
- distribution of organic soils;
- distribution of rocky outcrops and thin soils overlying such outcrops.

The Proponent shall also explain how the presence of permafrost is taken into account in designing the Great Whale complex.

3.2.0 Aquatic environment

3.2.1 Interior watercourses

The design of hydroelectric complexes depends largely on runoff volumes and their variability over time. However, a large portion of the permanent impacts on the environment caused by these complexes stems from a radical transformation of the natural flow of rivers. It is thus very important that this natural order is clearly understood. The Proponent shall therefore provide, for each disturbed site of interest:

- an analysis of the frequency and duration of flood and dry-weather flows for the winter and summer seasons;
- the methods used to evaluate the extreme values of precipitation, volume of runoff and flow;
- an analysis of variations in average monthly and annual flow;
- the most likely dates of fall freeze-over and spring thaw;
- remote sensing studies covering the past twenty years.

In order to evaluate the quality and productivity of habitats that will be destroyed or affected by river diversion, the Proponent shall describe the pertinent hydraulic characteristics of river sections with reduced or increased flow or those affected by damming. These characteristics (slope, speed, substrate, etc) can be used to determine the flow to be maintained in order to protect particularly valuable habitats.

3.2.2 The physical and chemical properties of surface water

In this section, the Proponent shall define the physical and chemical properties of the lacustrine and fluvial ecosystems, to include but not be limited to the following:

- the thermal regimes of northern rivers and lakes (boreal forest, taiga, tundra) and the main factors governing them;
- a complete portrait of the physical and chemical characteristics of test-case lacustrine and riparian environments, in which the selection of variables, the number of sampling sites, their location and the frequency of sampling are indicated. This portrait should be representative of the

annual cycle of variables used for analysis. The Proponent shall deal with the following variables and discuss the methods used for analysis and sampling:

- conductivity, Ph, bicarbonates, temperature and dissolved oxygen;
- transparency, colour, turbidity;
- total phosphorus, total Kjeldahl nitrogen, nitrites and nitrates, silica, total inorganic and organic carbon;
- tanins and lignines;
- chlorophyll and pheopigments;
- calcium, sodium, potassium, magnesium, manganese, iron, chlorides and sulphates.

In order to place the physical and chemical properties of water in context, the Proponent shall specify the factors which determine the chemical composition of rivers and lakes in the Canadian Shield and indicate factors which regulate or control such physical and chemical variables such as alkalinity, organic carbon and metals in the environment under study during the annual cycle.

3.2.3 Ecosystem characteristics

Plankton communities

Parallel with the physical and chemical descriptions, the Proponent shall describe the composition of phytoplankton and zooplankton communities at different times of the year to establish a profile of succession in the major taxonomic groups. It shall also submit data on the available primary production indices and indicate the reliability of this data in relation to on-site activity. It shall determine the zooplankton biomass in lacustrine and riparian ecosystems and explain the relative importance of different taxonomic groups in the total biomass.

Benthic communities

The Proponent shall enumerate the major taxonomic groups in the lacustrine and riparian ecosystems of the study area and describe their relationship with the physical variables affecting their number and distribution.

Macrophytic vegetation

The Proponent shall provide a description of the specific location and composition of each aquatic plant community and discuss its importance as a shelter, feeding or staging area for fauna.

Specific composition of fish populations

First, the Proponent shall present a complete list of species encountered in the territory under study and indicate their preferred habitats. The Proponent shall provide an inventory of fish habitats in the area and provide a table of the geographic distribution of species as a function of seasons. The Proponent shall identify factors which limit the distribution and abundance of each of these species.

Makeup of fish populations

The descriptions of the ichthyological populations shall include the principal parameters and dynamics of the population and factors governing the abundance and effects of at least the following elements:

- growth curves condition indices, relationship between length and weight;
- structure according to age sex;
- age of sexual maturity and the reproductive cycle;
- fertility;
- estimation of mortality indices (natural and due to fishing);
- diet of each species in relation to its planktonic and benthic communities should be linked together;
- interspecific relations.

Lastly, the Proponent shall identify the main fish parasites which influence the growth and survival of the most abundant species. It shall also describe their life cycles and the factors currently limiting their geographic distribution.

Freshwater harbour seals

The Proponent shall review existing knowledge of the genetic status, abundance, diet, recruitment, geographical distribution, preferred habitats and mortality factors of freshwater harbour seal populations in the rivers and lakes affected by the Great Whale complex. Special emphasis shall be placed on the

Loups Marins Lakes population, given its confinement to and dependence on these lakes. The Proponent shall also discuss the limiting factors that maintain this population at its present level, and establish how its environmental studies program will improve the level of information available on this species.

3.2.4 Estuarine ecosystems and Manitounuk Sound

The study area for this section includes the coastal waters of Hudson Bay, the estuaries of the Little Whale, Great Whale and Nastapoka Rivers and Manitounuk Sound.

3.2.4.1 Current physical characteristics of the estuaries and the sound

The Proponent shall present up-to-date information on the characteristics of each estuary likely to be altered by the proposed hydro-electric project. Salinity gradients, brackish areas, currents caused by tides, average tide levels and plume characteristics shall be identified as a function of river flow under natural conditions, with and without ice cover. All other hydrodynamic information required for a proper understanding of the dynamics of the estuaries under study is also to be provided, including ice cover and type of ice.

The Proponent shall describe the type of sediment present in the coastal and deep water areas of all river estuaries affected by the project, and shall pay special attention to the configuration of the sand spit at the mouth of the Great Whale River and the physical make-up of the Little Whale River estuary. The significance of wave climate, the flow of rivers, and littoral drift on the configuration of sand banks shalld also be examined.

The Proponent shall present a physical and chemical portrait of estuarine waters by referring to the parameters listed in section 3.2.2.

A mathematical model incorporating all pertinent parameters shall be developed, reproducing present conditions in the estuaries of the Little Whale, Great Whale and Nastapoka Rivers. The Proponent shall justify the choice of model used.

3.2.4.2 Biological characteristics of estuaries

The Proponent shall describe the estuarine processes linked to primary and secondary production specifying their role with respect to the ecology of larvae, fish and the recruitment of anadromous fish populations. Up-to-date information shall be provided on the concentration of nutrients and, particularly, on their importance for wildlife frequenting the estuary on a continuing or periodic basis. The Proponent shall also investigate the role of the mix of nutritive elements on the biological productivity of fish at the larval stage, and on the recruitment of anadromous fish.

Maps shall be provided on the abundance and distribution of sub-littoral vegetation at the mouth and on both banks of the estuaries. With regard to fish populations, the Proponent shall present data on the major species of anadromous fish in estuaries likely to be modified. The following main points shall be discussed:

- the geographic distribution and abundance of the various species present (whitefish, speckled trout, etc.) as well as their spawning ground;

- identification of genetically distinct species;

- reproductive strategies and limiting factors affecting annual migration cycles (salinity, temperature, water levels, ice, energy required for migration and wintering in fresh water);

- ecological factors affecting egg maturation and larval incubation and survival.

The Proponent shall establish growth curves for the various species present, along with an evaluation of mortality rates due to fishing and natural conditions. Data on sexual maturity and fertility are also required, as is a discussion of variations in recruitment from year to year.

The Proponent shall present data on marine mammals, particularly beluga in the estuaries, as well as on their abundance, seasonal distribution, and migratory patterns.

The Proponent shall provide a critical analysis of knowledge acquired on the estuarine environment of the Nastapoka, Great Whale and Little Whale Rivers as habitats for beluga, taking into consideration the use of these species in Hudson Bay and its evolution in Northern Quebec.

3.2.4.3 Marine environment

The Proponent shall present an analysis of the physical (temperature, salinity, circulation, ice conditions, etc) and chemical oceanography of Manitounuk Sound, covering, in particular, the turnover processes that determine how long waters stay in the Sound, and coastal waters between the Great Whale and Nastapoka estuaries. Nutrient transport under natural conditions and the composition of the sublittoral vegetation of the Sound and the Hudson Bay coastline, should also be discussed and the ecological significance of naturally occurring ice-free zones evaluated.

The Proponent shall review current knowledge of this ecosystem, in particular the following:

- bathometry;
- primary and secondary production and the factors which govern them;
- the composition, abundance and dynamics of benthic fauna;
- the importance of shellfish areas;
- the composition, abundance and life cycle of fish species and marine mammals.

In particular, the Proponent shall present current information on the distribution and ecology of the various species of marine mammals in the southeastern part of Hudson Bay, especially the significance of the movement of marine mammals and fish between the area affected by the project and adjacent areas (Belcher Islands, Umiujaq, Inukjuaq, etc) where these resources are used by the local population.

3.2.5 Mercury and mercury-related problems

An analysis of the factors governing the cycle and bioaccumulation of mercury shall be part of the impact assessment of the Great Whale complex. In this context, the Proponent shall deal with but not be limited to the following topics:

- the current state of knowledge of the biological, geological and chemical cycle of mercury in northern climates. This part of the study should focus on exchanges between the atmosphere, surface water, the terrestrial environment and the timeframe and characteristics of soil decomposition, and explain the physical and chemical factors that govern them as well as the particularities of the study area.

- the behaviour of mercury in flooded permafrost areas. The Proponent shall evaluate whether flooding in areas of continuous or discontinuous permafrost causes differences in the rate of release of mercury in comparison with reservoirs further south, where there is no permafrost;

- the concentration of inorganic mercury in precipitation, determining profiles for mercury concentrations in accumulated snow, as well as for mercury concentrations in runoff and surface waters, and their seasonal variations;

- inorganic mercury (and, if possible, methylmercury) in soils typifying the areas to be flooded;

- current knowledge of the toxicity of methylmercury to fish, mammals and avifauna;

- current contamination levels and bioaccumulation rates of the various species of fish for each drainage basin affected by the development of the Great Whale complex, including marine and estuarine ecosystems. Present rates of bioaccumulation for each area of the planned hydroelectric development must be determined. This study should use at least two piscivorous and two non-piscivorous species. This reference data must be measured so as to make it possible to monitor the variation of mercury levels at a later date;

- the mathematical modelling of mercury levels in fish communities in reservoirs. The Proponent shall take into account the structure of fish communities and the rates of mercury bioaccumulation and elimination in fish in comparing models that will be suitable for monitoring variations in the reservoirs of the Great Whale complex. The Proponent shall define the selected model and justify its choice;

- the study of mercury bioaccumulation downstream from hydroelectric works: the likely role of the different bioassimilation pathways and identification of the factors that govern the extent of this phenomenon;

- the estuarine and marine ecosystems: the biological, geological and chemical aspects of mercury relevant to the study of the behaviour of mercury in marine and brackish ecosystems;

- the bioaccumulation of methylmercury in marine mammals of Hudson Bay and in piscivorous birds, as well as the breakdown of organic and inorganic mercury in the various tissues and organs. If freshwater seals are included in the sampling, the study of mercury contamination should include these animals;

- an evaluation of the analytical methods available for the proportion of inorganic and organic mercury compounds in the environment. This evaluation shall deal with the various systems for classification of the types of mercury present and their significance. It shall also discuss operational constraints linked to taking and storing samples, as well as the limits of detection and reproducibility. The substrata analysed should include at least organic and inorganic soils, water and biological tissues, mainly from fish, birds and vegetation.

3.3.0 Upland and wetland ecosystems

The construction of the Great Whale complex will result in the loss of a large area of upland, wetland and riparian habitats that are among the most productive in the region.

The Proponent must study present conditions in the natural environment that may be altered if the project goes ahead. Upland vegetation and ecotones must be analyzed in terms of their indigenous plant communities (rare species, typical plant associations, range, limiting factors, etc.) and present bird and wildlife habitats.

3.3.1 Plant communities

The Proponent shall describe the composition, distribution, and dynamics of the most common plant communities, and the role played by disturbances such as forest fires.

The Proponent shall classify the different types of wetland habitats based partly on plant associations and partly on drainage system type, in order to define the habitats that might be lost in proportion to the entire watershed. Certain areas are of particular importance in this context: Lake Bienville, the lower Coats and Geoffroy River valleys, the

Lake Paimpont region, and areas around Lake Kakupis and lake Elizabeth.

The Proponent shall produce a map of plant communities in the study area and the characteristic physiographic seres in sites affected by the hydroelectric developments. Discussion of the physiographic seres should include the type of bedrock, surficial deposits, drainage classes, soils, gradients (in degrees) and plant associations representative of the ecosystem by altitude class.

The Proponent shall then discuss plant communities of particular interest to the region: rare populations, range extensions, special habitats, and areas used by Native peoples where species of particular interest (food, medicine, etc.) are found. These groupings are to be located and described using, among other methods, the remote sensing studies of the last twenty years.

3.3.2 Wildlife habitats

An evaluation shall be made of the quality of wildlife habitats which will be lost, particularly riparian and wetlands habitats. The Proponent shall therefore determine the composition, diversity and richness of wildlife species using the vegetation found in these environments, and shall also evaluate the wildlife productivity of each vegetation group for the region as a whole.

3.3.3 Regeneration and renaturalization

The soils characteristic of the Great Whale River basin appear vulnerable to the disturbances that may be caused by the project. This is obvious when one considers the problem of regeneration, following fires that have occurred over the past thirty years or so in these areas. The Proponent shall examine current conditions to determine the regeneration rates of previously disturbed ecosystems in northern regions.

The Proponent shall set forth clearly the knowledge acquired about the growth and regeneration of the main forest species and about reforestation of the region's spruce and pine forests. The Proponent shall especially take into account the experience acquired in the course of reclamation work carried out at the La Grande complex, and elsewhere, explaining to what extent such work might be suitable for the Great Whale complex region.

3.3.4 Burnt-over land and fires

One possible consequence of opening up the area is the increased risk of forest fires. To evaluate the impact of fires, the Proponent shall prepare a picture of the areas affected over the past 30 years. This shall include maps of burnt-over areas, the origin and date of the fires (if known), and the current status of the environment, including regeneration problems, and its use by wildlife and the human population using remote sensing studies performed over the last twenty years.

In the case where it would be advantageous to remove the combustible organic matter from a planned reservoir before flooding, fire might be considered as a means of stripping soil. Such an analysis requires an on-site study of the characteristics of recent fires, as well as an evaluation, in terms of chemical limnology, of combustion residues.

3.3.5 Land animals

With regard to wildlife, the Proponent shall make a connection between currently available habitat and its occupation, losses to be incurred in terms of biomass and harvesting for natives if the project proceeds.

3.3.5.1 Caribou

The Proponent shall discuss existing knowledge of the density and distribution of caribou in the territory under consideration over the past ten years and of habitats used by this species during the course of one full year, including the migratory routes and birthing grounds used and their location with respect to the areas affected by the proposed project.

The Proponent shall evaluate available data likely to permit a distinction to be made between the Lake Bienville herd (animals Native to this region) and the George River and Rivière Aux Feuilles herds.

The Proponent shall outline the limiting factors (critical birthing grounds habitats, predation, resource development, etc.) that have or could have an effect on caribou numbers and thus their density or distribution within the specific context of the study area.

3.3.5.2 Furbearers and other mammals

The Proponent shall present data available on the population dynamics, rate of exploitation, density, distribution and preferred habitats of beaver, muskrat, mink, otter, marten, lynx, wolves, wolverines, red fox, Arctic fox, fishers, black bear, polar bear, snowshoe hare, Arctic hare, musk ox and moose in the study area. Consideration shall also be given to marine mammals, such as seals, likely to be found in brackish and fresh water. Reductions or extensions to the area used for the project must be specified.

The Proponent shall also show the limiting factors affecting populations of the above-mentioned species, within the specific context of the study area.

For species characterized by a regular population cycle, the Proponent shall interpret data on population density and habitat use in light of the stage of the population cycle at the time inventories were conducted in the field. The Proponent shall also discuss the importance of the various species in terms of the size of their harvest, their economic and spiritual value to Native peoples, or to their ecological role.

3.3.5.3Birds

The Proponent shall provide an inventory of current bird populations (local and migratory), evaluating the number and distribution of bird species, especially waterfowl species of interest to Native peoples.

Current information shall be presented on the use of the east coast of Hudson Bay, especially Manitounuk Sound, by waterfowl, with special attention to the eider duck. In addition, the importance of eelgrass beds, particularly for the Brant, shall be examined. The territory under study should include the area from Long Island to the Nastapoka River estuary.

In the Bienville area, particular attention should be paid to the Canada Goose, Surf Scoter and Black Scoter, with, most importantly, a discussion of the factors likely to affect the reproductive success of these two species in the area.

Ice-free zones at the foot of rapids in the rivers within the study area are extremely important to certain avian species. The Proponent shall locate and identify these zones and describe them in terms of the number of species that use them, their respective abundance as well as their importance as a determining factor in the ecology of each species.

3.3.5.4Vulnerable rare or threatened species

From the standpoint of ensuring the diversity of species in Quebec, the developer shall discuss the preservation of vulnerable rare or threatened species in the area concerned, including relevant plant communities and the most important and fragile ecosystems.

This process will require input from various provincial (MENVIQ, MLCP) and federal (Environment Canada) agencies. The Proponent shall consult with them with respect to flora, plant communities, land and marine mammals, fish and birds. Current information shall then be discussed, and inventories which government authorities deem necessary in order to permit a decision on this project shall be carried out. The Proponent will present current and anticipated protection programs in this regard.

3.4.0 Analysis of the social environment and its various constituents

3.4.1 Dynamics of the communities affected by the project

The Proponent shall update the historic profile of the northern communities (Kuujjuarapik/Whapmagoostui, Chisasibi, Umiujak, Sanikiluak and Radisson) since the signing of the James Bay and Northern Quebec Agreement in 1975, as well as an evaluation of Cree and Inuit experiences with the military and government presence in the area, beginning in the 1950s. This would include a review of the various sociological and ethnographic studies conducted in the Kuujjuaraapik/Whapmagoostui region.

Organizations such as the Makivik Corporation, the Cree Regional Authority, the Grand Council of the Cree (CRA), the Kativik Regional Government (KRG) and the James Bay Municipality should also participate in describing the regional economy, given their involvement in previous studies carried out on this subject. The established methods of consultation as well as the objectives pursued in this regard are to be described.

The Proponent shall review existing information existing information pertaining to the demographics of the Northern environment in order to present a demographic profile on each Native community affected by the development of the Great Whale complex. This profile should include possible future scenarios for demographic dynamics as well as the limitations inherent in forecasting the demographic characteristics of each community.

3.4.2 Economy

The Proponent shall draw an economic profile of each of the Native villages. This profile is to deal specifically with the evolution of the hunting, fishing,and gathering economy as well as other traditional activities since the 1950's taking into account the institutional structure introduced by the James Bay and Northern Quebec Agreement.

In addition, the Proponent shall study the influence of current transportation systems on the cost, the availability of goods and services in the communities and on the identification of traditional methods of transportation (land and water).

In this section, the Proponent shall also assess the availability of information and the interpretive constraints involved.

The Proponent shall draw a historic and current portrait of land use (1950-1975 and 1975-1990) in the area influenced by the project. Traditional and modern land use of the territory by Native and non-Natives shall be clearly identified in the study area. This portrait shall describe the economy of hunting, fishing, gathering and other traditional activities (including sites considered to be sacred by Natives) taking into account the institutional framework set up under the James Bay and Northern Quebec Agreement.

The foundation and evolution of the process to select Category I and Category II land must be described in order to qualify any charges to this land regime. Parts of the area considered of particular interest (parks, reserves, conservation areas, sites or watercourses of interest for recreation or tourism, etc) to government bodies or other groups interested in the protection and development of the area will be presented and justified with respect to the objectives of the Natives and non-Natives. This presentation shall also take into account the impact of the project on the opening of the territory and its use by non-Natives.

The Proponent shall consider the present and potential land use by Native people for trapping, hunting, fishing and gathering. Special attention should be given to land use along Manitounuk Sound and the Great Whale, Little Whale and Nastapoka River estuaries in relation to the distribution of resources and their use by the inhabitants of Kuujjuarapik/Whapmagoostui and other populations. This review should outline the current situation and future prospects taking into account the social structures, spiritual value, harvesting level, and the importance of traditional foods.

The Great Whale complex will be developed in the context of the various land tenure systems established by the James Bay and Northern Quebec Agreement and the legislative acts associated with it. The Proponent shall indicate how it intends to take into account the land tenure systems governing the various land categories, including the areas alongside Hudson Bay and Manitounuk Sound. In addition, modifications to the land tenure system, as a result of the project shall be described in detail. In order to understand these modifications, the Proponent will discuss the history of the land tenure system, including the modifications that occured prior to and since the signing of the James Bay and Northern Quebec agreement in 1975.

3.4.3 Native archaeological and cultural heritage

Development of the Great Whale complex will result in the flooding and disappearance of a significant portion of the riparian environments of drainage basins. Insofar as important archaeological and historic sites are found in these environments, loss of cultural heritage is to be expected.

To this end, the Proponent shall provide an overall assessment of current archaeological knowledge of the study area and neighbouring regions affected by the hydroelectric project

As part of this review, the Proponent shall provide a critical assessment of the inventory and archaeological excavation program implemented during construction of the first phase of the La Grande complex.

Based on these data, the Proponent shall discuss at least the following aspects with reference to the Great Whale complex:

- A detailed description and critique of the methods used by the employer to identify potential archaeological sites, including:

    - criteria used to define potential archaeological sites and an explanation of their application method;
    - criteria selected on the basis of existing knowledge of prehistory or other considerations;
    - the results of all inventory work completed to check the validity of these methods.

- A description of the work done on the land, including identification of the inventoried areas.

- An overall assessment of the nature of archaeological resources in each major area affected by the hydroelectric development project, based on the results of studies completed to date.

- A description of archaeological sites already excavated and an interpretation of the data collected in doing so.

In this part of the study, the Proponent shall also share any information it obtains on Cree and Inuit cultural values related to areas that will be flooded or lost, particularly burial or birth sites and the value assigned to them.

The archaeological and historical study will require close collaboration with numerous specialists, including those of the Archaeology department, the Cree Regional Authority and the Avataq Cultural Institute.

3.4.4 Health

The Proponent shall examine the historical evolution of the health-related problems of the population of the area under study before 1975 and between 1975 and 1990. The mental and physical health of each of the populations affected should be investigated.

The Proponent shall approach this problem by examining at least the following aspects:

- the administration of health services and the involvement of local authorities;

- the scope and extent of social services available locally by government agencies as well as traditional means ;

- The Proponent shall investigate the quality of life of the communities, with particular attention to:

  - mortality and morbidity;
  - suicide;
  - conjugal and family violence.

- support systems available with respect to spiritual and cultural activities;

  - the Proponent shall establish a profile of the following:

  - the nutrition (the availability and importance of traditional food sources as well as complimentery food sources from the South);

  - diseases that provide indices of the evolution of health in particular diabetes, neoplasm and infectuous diseases;

  - alcohol and other substance abuse.

The Proponent shall have to explain the level of acceptability and the perception of problems feared by the Native population. Among other things, the Proponent shall have to explain how responsibilities are to be divided among the various authorities involved in the context of an environmental health supervision program. The Proponent shall portray the current situation, and prospective future outlook with respect to the following elements:

- new diseases (AIDS and others);
- electro-magnetic fields and their effects on health;
- changes to lifestyle due to opening the territory and the anticipated effects on:

  - individuals
  - family
  - community

The Proponent shall use the available scientific literature (Canada, United States and elsewhere) relevant to environmental health concerns in the environmental assesment process.

4.1.0 Project optimization and project variants

The Proponent shall analyse all the variants and sub-variants for the proposed hydroelectric complex, access infrastructure and camps and the collector system. This analysis shall be as detailed as possible and include all pertinent information required to compare the variants. The methodology and criteria used to arrive at an optimal project proposal shall be sufficient to allow alternative hypotheses to be tested by the review committees explicit.

Optimization means that the project design integrates the ecological and social objectives inherent in sustainable development. These objectives must be clearly stated in the impact assessment study. In particular, this exercise in optimization should ensure that the project design and mode of operation of the installations will permit long-term use of the area.

A optimization study must be characterized by sensitivity analyses, wherein various possible designs are examined in terms of their environmental and social costs and benefits. These analyses must define a plausible range of measures available to reduce the impact of the project, based on related costs and objectives; for example, indicating the point at which diverting a watercourse or flooding sensitive areas constitutes a compromise or an acceptable solution in both economic and environmental terms.

4.1.1 Variants

Two main variants for the Great Whale complex were accepted in the October 1981 guidelines for the purpose of a definitive project analysis:

- Variant A - Development of the Great Whale River with diversion of the Nastapoka, Little Whale and Boutin Rivers (item 4.A.1 of the preliminary information, October 1991);
- Variant B - Development of the Great Whale River only (item 4.A.2 of the preliminary information, October 1991).

Within variant A, the Proponent has identified various options which are described in the information bulletin titled "Complexe Grande-Baleine, bulletin no. 5, Hydro-Quebec, novembre 1991" and includes the following:

- Downstream diversion:

  Development of the Great Whale River with downstream diversion of the Little Whale River and diversion of the Nastapoka and Boutin Rivers.

- Upstream diversion:

  Development of the Great Whale River with upstream diversion of the Little Whale River and diversion of the Nastapoka River.

However, with regard to the downstream diversion, the Proponent has indicated, in a letter to the Quebec Department of the Environment dated February 21, 1992, that recent studies have led to the following optimized option:

- building three underground generating stations, GB-1, GB-2 and GB-3, each with its own reservoir on the Great Whale River,
- creating a control reservoir at Lake Bienville, and
- downstream diversion of the Little Whale River (40 km from its mouth) towards the GB-1 reservoir.

Also according to this letter, no diversion of the Nastapoka River is, for the time being, included in this development scenario.

In order to assure a clear understanding of the optimization principle mentioned above, the Proponent shall present a comparative study of variants A and B. In addition, as part of the examination of variant A the Proponent shall discuss the implications of including or not including the Nastapoka basin and compare the upstream and downstream diversion options to determine which solution would have the least impact. In this context, the Proponent must bear in mind that the ecological acceptability of variant A will be evaluated primarily on the basis of the following:

- An examination of existing information on the biology, habitat and status of the freshwater harbour seal found in Loups Marins Lake. The impact on this seal population will be evaluated in light of ecological modifications to the Nastapoka River basin. The Proponent should also determine how an environmental follow-up program might provide more accurate information on the genetic status, preferred habitats, and factors governing geographical distribution and recruitment of the species, before changes are made to the Nastapoka River drainage system.

- A critical analysis of existing information on the estuarine environments of the Nastapoka and Little Whale Rivers as habitats for the beluga whale, taking into account the status of the species in Hudson Bay. This examination shall also acknowledge the inherent limits of current knowledge and the possibility of more accurately evaluating the role of river flow into the estuarial ecosystem through a special research program.

- An evaluation of the fish habitats that may be lost or endangered downstream from the diversions, including that of anadromous fish in the estuary system, taking into account the various assumptions regarding maintenance of controlled flow, as well as the possibility of maintaining or restoring water levels in areas where such development would be physically possible.

- A study of the water-management measures available to limit the rise in water levels of lakes and rivers in order to preserve riparian ecosystems. This study will apply to all rivers and lakes affected by the diversions, including the Coats River, for which an evaluation of backflow and erosion phenomena, with and without ice, is especially important.

- An assessment of the distinct ecosystems that would be lost or substantially changed as a result of diversion, the possibility of protecting them and an evaluation of the visual appearance of the rivers affected, taking into account changes in flow dynamics caused by the diversions.

- An analysis of the scenarios that would ensure the integrity or maintenance of controlled flows on those river sections deemed critical (on the Great Whale, Little Whale and Boutin). The Proponent shall not only discuss the relevance of maintaining these flows, but also forecast several scenarios, evaluating environmental benefits derived from various residual flows in comparison to present flow rates. The Proponent shall clarify the critical flow rate to be used (mean annual flow, mean monthly flow, low-water flow, etc.), and shall evaluate the advisability of varying the minimum flow rates according to environmental requirements and the resources to be protected.

The points discussed above are among those factors which, together, will determine the ecological acceptability of the proposed diversions; additional diversion-related effects that cannot be mitigated must also be ascertained. Lastly, the practical limitations of available information must be defined as clearly as possible.

4.1.2 Sub-variants

For a clearer understanding of what is meant by sub-variants, some of them will be reviewed briefly in this section. Obviously, the Proponent will have to discuss each one in greater detail in the impact assessment study. The Proponent shall describe all studies carried out and any resulting modifications to the project since the early 1980s when the project was proposed. All such modifications must be justified and their environmental implications explained.

With respect to the unchanged aspects of the project, the Proponent is to state whether any of them are to be reviewed before construction begins.

In general, the following "sub-variants" were established in the Environmental Impact Study submitted in the early 1980's and should be incorporated into a detailed analysis of the project.

- Location of the GB-1 generating station

  The ecological and geotechnical comparative analysis of the sub-variants involving the Lebel and Domanchin valleys should point out new known factors (geotechnical considerations and optimization of the generating station's forebay) related to the location of the GB-1 generating station.

- Optimization of forebays (GB-1, 2, 3 and Bienville)

  The Proponent must link the operating criteria for the future containment bays to possible terms and conditions for managing fish habitats, and demonstrate how ecological considerations will affect the selection of minimum and maximum operating levels.

- Spillways

  The location of spillways must be discussed from the viewpoint of possible variants for all structures in the Great Whale complex. Special attention should be paid, however, to a comparitive study of the two location options for the GB-1 forebay: Manitounuk Sound and the Great Whale River. This study should identify the main ecological, technical and economic issues related to both options, with emphasis on (a) maintaining controlled flow in the river, and (b) possible management of the water levels in this area.

- Load factors

Using a load factor of about 0.60 or less for the entire complex, rather than 0.76, could have significant ecological consequences. Since this decision has not yet been made as part of the project evaluation, the Proponent shall define the principal repercussions of each of the main variants and sub-variants, related to load-factor selection. In this context, special attention should be devoted to mathematical models of ice conditions and the freshwater/saltwater mix in Manitounuk Sound. Also important are the chemical, sedimentological and biological impacts of modifications to circulation and exchange mechanisms.

- GB-1 generating station tailrace

In preliminary studies of the Great Whale complex in the early 1980s, the Proponent stated that the exchange of fresh and salt water in Manitounuk Sound would depend on the location and geometry of the GB-1 generating station tailrace as well as its vertical and horizontal positioning. The load factor of this generating station and its location (Lebel as opposed to Domanchin) will also play important roles in this process.

From this standpoint, the design of the tailrace lends itself to environmental optimization. Such optimization will depend on the ecological objectives, which will have to reflect a profound understanding of the physical, chemical, sedimentological and biological oceanography of Manitounuk Sound.

Technical documentation explaining the range of plausible scenarios with regard to tailrace design must be provided. The Proponent shall discuss the hydraulic and ecological criteria that have been used to demonstrate the relationship between tailrace design and ecological objectives. This analysis shall also take into account studies on freeze-up, break-up, ice configuration and polynya.

The Proponent shall pay particular attention to choosing the dimensions and shape of the tailrace canal, its offshore and its vertical position relative to sea level and the pycnocline in Manitounuk Sound and discharge rate on the local marine environment. Among environmental considerations associated with Manitounuk Sound, special attention should be given to the following points: stratification density, local erosion, turbidity, primary production, presence or absence of ice and the destruction of eelgrass beds and benthic organisms. In addition, consideration shall be given to the impact of the design of the tailrace canal on Native use of Manitounuk Sound.

The Proponent shall pay particular attention to blasting requirements for the various tailrace variants under study. The appropriate criteria for use of explosives shall be established and justified, with details as to how the procedure will be controlled.

- Protection of Lake Kakupis

The Proponent should take into account the comparitive study of the option that would protect Lake Kakupis completely by raising water levels in Lake Elizabeth to channel diverted waters into the Coats River. Problems related to dredging the shallows in relation to the rise in water level also apply here.

- Development of the eastern sector of the Great Whale River

In optimizing the Great Whale project, various possibilities for developing the area east of the Great Whale River should be considered.

The impact study shall report on the current studies with regard to "overdesigning" the Bienville reservoir, as mentioned in the information provided by the Proponent. The possibility of modifying the dikes and limiting the extent of the flooded areas in the region near Lake Bienville will also have to be taken into account.

In this regard, a comparison should be made of the advantages of reducing flooding in the Lake Bienville region and the disadvantages of raising water levels in the GB-3 and Paimpont regions.

4.1.3 Steps to follow

In light of statements regarding variants and sub-variants the Proponent shall take these options into account in the Chapters dealing with the project description and the resulting impacts. In its analysis leading to the selection of the preferred variant, the Proponent shall include the environmental implications of each variant considered. This process will require the Proponent to undertake a detailed study of the two main variants before making a choice, and to optimize the project in relation to the sub-variants mentioned earlier.

The Proponent shall also indicate the implications of accepting one option or the other on the choice of access infrastructures and collector system design. The construction of such access infrastructure north of LG-2 shall be based on a well defined rationale and optimization process. The Proponent shall take into account existing infrastructure and future needs, both in terms of safety for present day residents and in terms of land development.

Lastly, the impact of variants associated with changes to the deadline for completion of the project and impoundment of reservoirs shall be dealt with in detail.

4.2.0 Hydroelectric complex

The description of all work and construction must be detailed for each variant, and shall include at least the following subjects:

- the time of the year, frequency and amplitude (maximum and minimum levels) of the intertidal ranges of all water bodies;
- the maximum and minimum surface areas of reservoirs and forebays, with detailed maps, and residence time of water masses;
- the flow rates (maximum, minimum and average) in the sections of the rivers affected, with detailed maps showing the areas affected and seasonal variations in water levels;
- maps of all facilities and dikes;
- maximum and minimum operating levels;
- a description of generating stations, with emphasis on the information required to understand and evaluate the project;

- type of turbine: maximum gross head and maximum quantity of turbine water;
- the height and amount of backfill;
- dimensions of the spillways, number of gates, maximum capacity;
- dimensions and direction of tailrace canal and related structures;
- diversion works;
- construction schedule based on the various plausible hypotheses.

The data must clearly explain the mode of operation and the operational links between all reservoirs. It should also include the frequency and intensity of the flows to the spillways for all reservoirs and clearly explain how they are to work. The Proponent shall identify both permanent and temporary facilities.

4.2.1 Related infrastructure

For each of the variants and sub-variants, the Proponent shall identify the ancillary installations required for construction of the complex. The Proponent shall indicate whether they will be permanent or temporary and whether they will be used for purposes other than those required for the hydroelectric project.

Special attention is to be paid to the setting up of camps, construction of villages and airport installations, the use of borrow pits, the construction of access roads, the use and construction of wharfs, if need be, and the installation of waste disposal sites or industrial facilities that might discharge contaminants into the environment. In this regard, the Proponent shall also identify and quantify the use and production of dangerous products and waste generated by the project.

In order to avoid continual adjustments to the initial authorization orders, the Proponent shall identify its needs, as precisely as possible, from the very beginning with regard to the project area.

It is understood that certain specific details on some of the components may not be available when the impact assessment study is drawn up. These may be submitted later, at the Department's option, in accordance with the conditions for authorization of the project.

However, for each component, it is important to indicate in the study the location of the installations, their scope, site preparation, design criteria and the possibilities of reutilization (or the requests in this regard) once the work is completed.

More specifically, the Proponent shall deal in detail with each installation mentioned below.

4.2.1.1 Access roads

In general terms, access roads include secondary, temporary or permanent roads that lead to dikes, villages and camps, to airports or other installations needed for construction and operation of the permanent infrastructures. The Proponent shall specify the roads or sections of roads that can be used as winter routes taking into account the constraints inherent in the project development, and the opinions expressed by the population or by the future users of the territory. The Proponent shall describe the technical characteristics and general road construction standards for the various road sections, including:

- technical components justifying the choice of the existing route;
- length;
- width of the right of way, the road itself and the shoulders;
- standards for curbs, slopes, backfill and excavations, speed limit, load capacity;
- gradation of materials (particularly in the case of environments containing organic deposits likely to contain permanent ice lenses);

Work to be done:

The Proponent shall describe the principal work to be completed during the various pre-construction, construction and maintenance phases:

- land clearing and disposal of wood;
- clearing of organic materials and disposal methods;
- rock excavation;
- shaping of road, spreading, compacting of materials.

- service infrastructure (service stations, maintenance centres, parking areas);

- special techniques and precautions to be taken in permafrost areas;

- road signs for safety and directions;

- maintenance and repair of the pavement, shoulders, ditches, bridges and culverts;

- use of dust-control products and de-icers;

4.2.1.2Crossing of watercourses

Some of the work, such as the construction of bridges and the installation of culverts, and travel by ferryboat shall be described in more detail. For all of this work, the Proponent shall provide as accurate a description as possible by clearly identifying alternatives.

The Proponent shall certify that such infrastructures comply with standards for forest management for forests in the public domain, particularly with regard to narrowing watercourses and maintaining their navigability.

The Proponent shall also accord particular importance to the work period and work sites in order to ensure that the movement and, especially, the spawning of fish are not affected.

The Proponent shall indicate the access roads that will be maintained or reused at the end of the project, and specify the future status of infrastructures used to cross the watercourses.

Construction of bridges

The Proponent shall describe and pinpoint the location of proposed bridges, and provide details concerning the size of clearings and earthworks planned for each side of watercourses where a bridge will be built. This description shall cover a minimum distance of 60 metres from the edge of the water. Furthermore, the temporary structures required to approach and cross large watercourses shall be described. If necessary, the Proponent shall describe the infrastructures required to maintain user access to watercourses.

Installation of culverts

The Proponent shall discuss the advantages and disadvantages of the various types of culverts available, as well as their possible use in the project. The type of culvert selected, the methods used to calculate the necessary dimensions and the installation details shall be indicated.

Regarding installation, the Proponent shall indicate the standards related to the slope permitted, the depth and the overlapping in relation to the bed of the watercourse. The Proponent shall also specify the stabilization work required, for example ripraps on the banks around the pipe near the end of the culvert.

A list describing the location, type and size of all culverts installed on permanent streams shall be included to facilitate monitoring operations. The Proponent shall indicate which access roads will be maintained and reused at the end of construction.

4.2.1.3Camps and villages

The Proponent must establish a housing facility in order to implement its project. The Proponent shall therefore clearly describe the housing facilities it will require and the planned organization of the construction site in terms of worker movements outside camps, on-site safety measures for users of the area, etc. The Proponent shall also specify if and how alcoholic beverages will be sold in the camps.

The Proponent must indicate the exact location of each camp and submit development plans for these facilities, including their capacities and periods of use.

The development plans for each camp must include at least the following:

- drinking water supply source;
- method of managing wastewater and discharge areas;
- location and operating conditions of the solid waste disposal site;
- power supply (generator capacities, location, etc.);

- management of any other installations (including fuel storage depots) required for the camps to function properly.

Several of these camps will be installed in particularly open areas, favourable to heavy or off-road vehicle traffic. Since these environments are especially fragile, the Proponent shall indicate how measure shall be taken to avoid disturbing them. The Proponent shall give special attention to the protection of riparian and aquatic habitats and sites of cultural or religious significance.

Finally, the Proponent shall indicate whether some of the camps will become permanent or be given to various local parties interested in reusing them.

4.2.1.4Borrow pits

Under this heading, the Proponent shall define in precise terms, the exploitation of borrow pits required for the project.

The Proponent shall specify the standards for the location of borrow pits in relation to roads, watercourses, wildlife areas and the boundaries of future reservoirs, in observance of the relevant regulations, particularities and potential of the environment. The operating standards shall be examined with regard, for example, to the depth of the groundwater, the necessary exploration work and the access roads to be built. Taking this into account, the Proponent shall clearly explain how the borrow pit material required for the project was optimized. To this end, the study must make it possible to assess the Proponent's actual needs and possible alternatives, into which the ecological value of the ecosystems and the cost of the alternatives shall be incorporated.

The Proponent shall locate and map all planned facilities, specifying access roads, available materials, areas and required volumes of material. The Proponent shall also take into account maintenance requirements for the project.

4.2.2 Telecommunications

Development of the Great Whale complex will require a telecommunications network to ensure effective coordination of the work.

The Proponent must specify the scope of any telecommunications systems that it is directly involved in setting up (transmission towers, access roads, energy sources, etc.)

4.3.0 Access and housing infrastructures

The term "access roads" refers to all roads, including permanent and temporary secondary roads. All airports required for the opening of the territory shall also be studied. The term "accommodations" refers to the camps required for construction of the airports and roads. Technical information requested in the previous section (4.2.1 to 4.2.1.4) shall also be provided.

More specifically, the possibility of establishing a road link between Kuujjuarapik/Whapmagoostui and the rest of the territory will be examined, including a clear explanation of the environmental and social implications of this type of link. The Proponent shall also discuss the problems involved in selecting an appropriate site for the Great Whale River area which would adequately serve both the Cree and Inuit communities, as well as the Proponent. With that in mind, intermediate locations for the airport and the roadway should also be considered.

4.3.1 Access roads

Regarding access roads, the Proponent shall describe the various routes and corridors under consideration and indicate whether some will be modified before work starts. The Proponent shall also justify both the study area and the routes and corridors retained, and clearly highlight the concerns and preferences stated during the consultation hearings. In this regard, a photographic file of ecologically sensitive areas and a mosaic of the route itself should be provided to facilitate review.

- North-South access (LG-2/Fagnant/GB-1) and East-West (Fagnant - Bienville).

  The Proponent shall discuss the technical justification for selection of the current route and will re-examine the variants described briefly in the Complementary document prepared after consultations were held in 1981 with the Native populations and other users of the territory.

- GB-1/Kuujjuarapik/Whapmagoostui branch road

The Proponent shall propose routes to link the GB-1 construction site to Kuujjuarapik/Whapmagoostui and will present a comparative evaluation between a route along the Manitounuk Sound coastline and an interior route. This evaluation shall take into account the different airport sites under study, as well as the results of the study on the cumulative impacts of the transportation corridor on Manitounuk Sound.

The Proponent shall also include at least the following information within the project analysis:

- suggest alternative routes in areas where highly sensitive watercourses are crossed (e.g., spawning beds);
- justify the use of winter routes especially those sections outside of the future territory;
- indicate how the design of the road takes permafrost into account;
- present the results of archaeological digs of roads and borrow pits; explain methodology and research strategies; describe the locations of archaeological digs and interpret the data collected;
- identify areas of special interest (panoramic site, access to a resource, etc.) and indicate how the routes selected take into account protection and conservation measures;
- identify access roads that must be abandoned on completion of the project and the planned abandonment procedures; provide information on the related consultative process to be undertaken and its contractual obligations; identify its responsibilities over the medium and long terms with respect to maintenance of the proposed access installations and service installations on access roads;
- identify emergency measures to cope with accidental spills of petroleum or hazardous products; describe these measures in detail, including the anticipated intervention time and environmental risks.

4.3.2 Airports

This portion of the guidelines applies to all permanent and temporary airports, as well as all to seaplane and helicopter bases required for the project. It concerns activities related to the construction, operation, maintenance and closing down of these infrastructures, as well as the restoration of the sites used.

Should any of these installations show particular characteristics, the Proponent shall clearly indicate them, and modify the impact statement accordingly. For each accepted site, the following technical information shall be supplied:

- characteristics of the runway, terminal, landing docks, hangars and other buildings, as well as of the navigational equipment;
- access roads, including a presentation of alternate routes;
- sources of electrical supply;
- a plan of the runway drainage system;
- borrow pit materials: location, surface area, volumes, and types required;
- a fire protection system plan;
- an explanation of the proposed plane de-icing process and the containment of substances used;
- location and description of fuel tanks and containment systems, safety measures and emergency procedures in the event of a spill;
- a description of the proposed construction methods and the maintenance work and equipment required;
- results of archaeological searches;
- description and location of the drinking water supply system, and the waste water and solid waste disposal system;
- estimate of the duration, frequency (day and night) and extent of use of the proposed infrastructures, and the amount of cargo and number of passengers passing through them;
- a summary of servitudes which may ensue from these infrastructures;
- a description of the manpower required for the construction and operation phases;

- work schedule.

4.3.2.1 Selection of airport sites

The Proponent shall present a list of potential airport sites, and the positive and negative attributes for each site.

The requirements for airport infrastructures shall be used for the assessment of each site under consideration. The comparative analysis shall take into account the needs of other local and regional intervenors. These needs will be identified during consultations with the communities concerned. Air service quality during construction work and the various clients that may use these facilities, even if they are private, shall also be considered.

The Proponent shall discuss the biophysical (topography, meteorology, threat to birds, etc.) and social constraints involved. The Proponent shall indicate the reasons for site selection and justify the rejection of other sites. Potential sites shall be indicated with regard to future camps and other infrastructure relating to the complex. The sites accepted shall be the object of a detailed review.

Permanent airports:

- Airport for the GB-1 and Kuujjuarapik/Whapmagoostui

For this particular sector, the Proponent shall prepare a detailed comparative evaluation of the following scenarios:

- improving the runway, existing infrastructures and support services at Kuujjuarapik/Whapmagoostui;

- establishing an airport on an intermediate site between GB-1 and Kuujjuarapik/Whapmagoostui to serve both locations. The possibility of establishing an airport on the coast or further inland should be examined in depth. In this context, Category I and II lands should not necessarily be interpreted as an absolute restriction in terms of the site selection;

- building a runway next to the GB-1 station construction site.

The comparative analyses will take into account the transportation needs of both the Proponent and those of other local and regional parties involved, including the Cree, Inuit and Provincial ministries.

These evaluations will be based on representative consultations with the parties involved, and the results of these consultations shall be presented as an integral part of the impact statement. Concerns regarding the safety of the existing runway at Kuujjuarapik/ Whapmagoostui shall be covered. Planning for these structures will extend over a target period of at least twenty-five years.

- Airport between GB-2 and GB-3 and other airports

For these airports, the Proponent shall discuss the various alternatives considered. The sites selected by the Proponent shall be examined in detail. The Proponent shall identify and justify its needs as well as the needs of other interested clientele, and shall meet the specific requirements of these guidelines.

Temporary airports:

For this type of airport, the Proponent shall also identify and justify its needs while responding to the specific requirements provided in this guideline. In addition, the Proponent shall determine the problems involved in transport by floatplane and the installations and equipment required. In particular, the Proponent shall discuss supplying winter camps at the Bienville reservoir and in areas where the diversions are planned.

The Proponent shall also indicate the probability of these installations becoming permanent.

The Proponent shall also explain how the engineering in the area of the diversions or related to control structures may affect the use of temporary winter runways. If runways are required on dry land, the Proponent must justify them.

With regard to a proposed runway at Fagnant Lake, the Proponent shall pay particular attention to the biophysical assessment of the site and the protective measures that it intends to apply to reduce disturbances to the natural environment to a strict minimum and to protect the sector in general. The Proponent shall also evaluate the possibility of using other sites or of only using permanent sites.

The Proponent shall also specify the possibility of these installations becoming permanent.

4.3.2.2 Status and maintenance of access infrastructures

The Proponent shall describe the legal status of new access infrastructures during and after the construction of the Great Whale complex. The following, in particular, should be discussed:

- Will access roads be public or private and on what basis will this decision be taken? The Proponent shall assess the rationale for establishing a control system similar to that put in place by SEBJ during the first phase of construction at James Bay;
- Who will provide maintenance and information services for access roads, including the installation of rest areas, waste collection, snow removal, etc.?;
- Who will be responsible for road safety?;
- What kinds of dust-control and de-icing products will be used and how? (ex: water, oil, NaCl, $CaCl_2$, $MgCl_2$, ligno-sulfanates, etc.);
- The Proponent shall describe in the impact statement any agreement reached with other parties regarding the status and maintenance of access roads, and report on consultations held on the subject.

4.4.0 Collector system

The Proponent shall identify in a logical and verifiable way an adequate number of corridors within the study areas so that a preferred corridor or equivalent corridors may be selected. When this first step is completed, a second set of guidelines, dealing with the routes and the choice of a preferred route within the accepted corridor, will be sent to the Proponent so that the detailed statement may be finalized.

In theory, establishment of the system should require as many corridors as there are lines; in practice, however, one corridor can accommodate two lines when they can be linked together and the rights of way combined. The Proponent shall plan to combine the two lines linking the GB-1 generating station to the Radisson station. The Proponent shall also indicate how it optimized the choice of distribution corridors and on what basis this optimization was based. Lastly, the Proponent shall explain how land use by native peoples was considered in preparing routes for the lines, referring in particular to the James Bay and Northern Quebec Agreement and to consultations with concerned parties.

4.4.1 Technical characteristics

The Proponent shall provide the technical characteristics of the construction of the lines, and if applicable, the proposed switching stations or modifications to existing stations. Particular emphasis shall be placed on the characteristics necessary for analyzing the choice of corridors. The Proponent shall present the technical constraints related to the collector system, and shall also take into account the transportation and accommodation infrastructures required for the project.

The Proponent shall deal with the physical constraints (distance, hydrology, relief, permafrost, verglas, wind and ice etc.) affecting the construction work and the installation of lines. The Proponent shall specify the design criteria related to the project, as well as all information concerning technical construction methods that could influence the choice of corridors and allow the planning in progress to be understood.

The Proponent shall also specify the details for execution of the project according to the updated construction schedule, as well as the margin of maneuverability.

4.4.2 Identification of corridor options

The Proponent shall reiterate the main options developed for the energy transmission system by highlighting the advantages and disadvantages of each option. The Proponent shall discuss the salient technical, economic and environmental points that will enable readers to understand why the study areas and corridors were selected.

The Proponent shall discuss the project's flexibility, in particular by demonstrating how the reliability criteria justified changing a 735-kV line, as initially planned, to two 315-kV lines in the western part of the territory. The Proponent shall explain its choice of using a double-circuit 315-Kv line between GB1 and Radisson, and a single-circuit line between GB2 or GB3 and the

Chisasibi station. Finally, the Proponent shall also explain how the options being studied, concerning for example; the harnessing of the Little Whale River, could modify the Complex's capacity and the design of the distribution system. The Proponent shall also specify the technical and economic implications of transmitting the energy produced at GB2 and GB3 elsewhere than througb the Chisasibi station by connecting GB1 to LG2 or by going further east through the Tilly station.

The modifications to be made to the Chisasibi and Radisson stations shall be presented in detail.

The Proponent shall also deal with the implications of this aspect of the project with regard to the need to construct a 14th transmission line further south and the implications of this project on the reliability of the rest of the Quebec network.

The Proponent shall present the reasons leading to the choice of an option and consequently, the establishment of the study areas for the lines to be constructed. The Proponent shall discuss the integration of this option into the existing and future system.

4.5.0 Role of government agencies in project management

The Proponent shall explain in what ways other public bodies responsible for regional development are part of the decision to go ahead with the project. For example, it shall specify the role of the Quebec Department of Transport concerning the Kuujjuarapik airport and the future maintenance of access roads; the role of the Department of Recreation, Hunting and Fishing concerning the exploitation of wildlife or that of Transport Canada concerning navigable waters.

4.6.0 Schedule and project cost

The Proponent shall give a detailed schedule for the construction of the project, clearly indicating the available room to manoeuvre. If need be, the increments impact related to this possible variation in the deadline should be evaluated. It is important to note that the authorization will be based on a project with well defined dates for the start of construction work. A significant delay in the planned schedule, or an unforeseen slowdown could justify reconsideration of the authorization of the project or the conditions attached to the authorization of the project.

In addition, the Proponent shall provide the costs of the various project components.

4.7.0 Local and regional economic spinoffs

For each of the various phases of the construction of the project, including its operation, the Proponent shall identify the major construction site activities and provide a profile of the work force requirements for each of these activities.

4.8.0 Overview and synthesis

For clarification, the Proponent shall end this Chapter with an overview and synthesis of the variants considered and the associated sub-variants for the complex, access infrastructures and camps and the collector system.

The Proponent shall indicate the various components of each variant (number of dikes, installed capacity, length of roads, work schedule, etc.) in order to give a comprehensive portrait of the options considered.

Furthermore, the Proponent shall identify the similarities and differences between the variants. This presentation should serve as the basis for the next Chapter, which deals with impact assessment.

5.0 IMPACTS OF THE PROJECT

5.1.0 General approach

The Proponent shall carry out a comparative analysis of the different social and environmental implications for each of the possible scenarios and variants within the project proposal. This analysis should permit a judgement of the project's acceptability and present the most acceptable technical, economic and environmental components for the project.

Although the Proponent must take local resources and ecological impacts into account in the analysis, the Native peoples' way of life and resource use, as well as the economic development of the area must also be considered.

The major impacts shall be analysed in detail. Where the impacts might seem minor or negligible at first sight, it is incumbent on the Proponent to provide evidence that it would serve no useful purpose to examine them in greater detail. The Proponent shall ensure that technical support documents are sufficiently detailed in order for the analytical data to be useful.

The analysis of the variants and sub-variants must clearly determine the impacts considered unavoided, as well as those considered irreversible. The loss of habitat or natural resources as a result of the project must be assessed and estimated in the context of the cumulative impacts attributable to the Great Whale complex.

Furthermore, the impact assessment study of the project must include a critical analysis of the knowledge acquired at the La Grande complex and elsewhere (e.g., the Churchill-Nelson complex) for comparable projects in similar ecosystems. In evaluating the impact of the Great Whale project, data collected for these other projects shall be examined, but local differences in the environments of these regions shall also be taken into account.

The synthesis of impacts shall include maps in order to facilitate understanding.

The Proponent shall estimate the environmental losses and modifications to ecological conditions as a function of the resources, land use and occupation, and the carrying capacity of the various ecosystems.

The Proponent shall evaluate the probable impacts of Great Whale's hydroelectric developments on the environment, based on forecasts or appropriate hypotheses for each of the study areas already mentioned. These hypotheses shall be placed in the context of an environmental follow-up program. The Proponent shall take care to avoid forecasts which are too general or obvious.

This evaluation of the various hypotheses concerning the expected impacts shall obviously take into account findings on other hydroelectric developments (La Grande, Churchill, Churchill-Nelson) and discuss the elements of these experiences which are applicable to Great Whale. However, physiographic, ecological or social factors which distinguish these various projects should be clearly identified.

The impact study should also consider the social impacts of each of the project variants for both the construction and operation phases, as well as the short and long term effects of the construction of access roads to the territory. The Proponent will evaluate the overall probable transformations to the way of life of the various communities affected by the proposed project, including the inhabitants of the Belcher Islands.

5.1.1 The study of social impacts

The issue of social impacts is often perceived by the public as being central to any project evaluation as well as a particularly difficult and complex aspect of the study. Among the many obstacles to a realistic evaluation are that public opinion is often confused with social impact, that societies are never simple, and that their components seldom remain static. Most studies thus run the risk of seeming incomplete, biased or unsatisfactory. This is especially true when studies yield to the twofold temptation of ascribing pertinence to what is easily measured, and amassing details of social life in a long heterogenous list of isolated subjects which becomes interminable.

It is essential that the Proponent adopt a clear hierarchical structure in which to evaluate its concerns regarding the social impacts of the project. It must be assumed at the outset that certain sociological statistics have greater significance than others and, consequently, require particular attention. Essentially, the evaluation of the social environment depends on such factors, while others can immediately be labelled as less significant. All in all, it is essential to establish a hierarchy of study priorities which will depict the overall feeling of the society and guide all subsequent discussions and analyses. The process should, in addition, avoid the assertion (deliberate or otherwise) that the effect of such a project on a society can be reduced to fluctuations in the price of flour or the preservation of a few archaeological sites.

The Proponent should therefore classify the impacts of the project on the social environment according to a tripartite hierarchy. Each level is important; however, the priorities should be clearly organized in descending order of importance, creating a research priority order.

5.1.1.1 Major issues

First, it should be recognized that human society does not react to change with one voice, directly and almost mechanically. It is a well known fact that human beings are remarkably adaptable and that societies have been able to survive and hold their own in painfully difficult conditions. In short, the nature of a development project does not automatically or necessarily determine its impact on a society, since society never remains passive or inert. On the contrary, society often interprets, understands and organizes change and the consequences of change in the context of its circumstances.

It must therefore be realized that a change in daily life caused by a development project can either have a positive or a negative effect, depending on the attitude of society towards that change. When a development project is not only accepted as reasonable, but it is even desired and welcome, its consequences will be seen as beneficial or at least acceptable. If the same change is feared as a threat to be resisted, its impact will be seen as disruptive, irritating or even calamitous.

A society which decides to resist a project will transform each of its consequences into a social problem, whereas a society which chooses to accept the same development will tackle the job of mitigating and remedying its every inconvenience. This is why the impacts of the project on the feelings of alienation of the society must be the first consideration. An evaluation must be made of the extent to which the people most directly affected by the project are willing to assume the inherent costs and inconveniences of the project. Because the project seems reasonable to them, they feel that it belongs to them, and it gives them a sense of pride; such individuals have the will to act which constitutes the best guarantee against all the potential negative aspects of the project.

On the contrary, almost all the testimony heard during the preparation of the guidelines would seem to indicate that the inhabitants of the area most directly affected by the project view the project as being unwarranted and an inequitable intrusion into the life of a northern society. They feel that northern societies must bear most of the costs of the project, while another society in the south reaps most of the benefits. It is this sense of alienation, the fear or belief that control over one's life and future has been lost, that could lead to a series of disturbing and deplorable social problems, rather than the project itself, in all its myriad of details.

The most important question to which any evaluation of the social impacts of a project must respond is: how can the project encourage a dynamic acceptance of the project which would enable people in the region to tackle potential negative social repercussions or, on the other hand, what might increase the type of discouragement which could only lead to an interminable series of social problems?

5.1.1.2 Specific questions

The project under study has a number of specific characteristics which will be major causes of change in the social life of the region. Two of these characteristics need to be examined very closely. First, the project will have the notorious "boom and bust" effect. This means that during the years of construction, the social environment will be massively disrupted by the activity which will seem intense, not only in contrast to the current situation, but compared with the relative calm that will follow the end of construction.

The effect could be significant, since the impact will be very sudden, both at the start of work and at the end of a period of intense activity. As with any construction project, this disruption could be acceptable and without a long term effect because it is of short duration and ends upon completion of the project. On the other hand, the disruption, however temporary, could cause a shock from which there would be no recovery. The abrupt termination of work could frustrate the hopes of those who believed that this level of activity would last longer. All the facets of the brutal boom and bust effect and all of its consequences require careful examination.

This project will have another major effect, perhaps less sudden, but of much longer duration. There are those who claim that the construction of roads and airports, which will open up the territory for the first time, constitutes the primary source of social impact from the project. The inhabitants of the North would have much easier access not only to the other parts of the territory, but also to the rest of the American continent. Southerners will, for the first time, have a route of entry to the North which could be used by tourists, hunters and mining interests, as well as for commercial exploitation of wild game. An examination of the long term implications of this opening up of the territory is an essential element in studying the social impacts of the project.

Thus, it will be necessary to evaluate how the construction of access routes responds to the future demands as a result of coherent planning and to a more extensive program to open up and develop the area concerned. In addition, the anticipated future use of these access routes, the number and type of users, and the consequences of the new mobility and interpenetration among these isolated regions must be evaluated.

5.1.1.3 Particular issues

The principal foreseeable impacts of the project require consideration and discussion. Below is a synthesis of the most obvious concerns regarding the social and biophysical impacts of the project. Because of the socio-economic structures of the affected communities, a constant interrelationship between the biophysical and social impacts exists. They are therefore integrated in the text that follows so as to avoid having two distinct Chapters which could have been repetitive.

This list brings together, in no particular order of priority, a variety of considerations with regard to specific details of the project, investigative methods, and even indices of familiarity with and knowledge of the environment. Each of the following issues must be part of the final assessment. This list does not represent a request for an encyclopedic study, nor is this list exhaustive.

5.2.0 Mercury

As in the case of the La Grande complex, increased mercury contamination that accumulates in the food chain constitutes a major impact. Therefore, after reviewing the pertinent scientific knowledge and the available reference data for the Great Whale complex region, the Proponent shall project mercury contamination figures for fish in the reservoirs and forebays of the complex or any other area that may be affected. For example, death of fish in the turbines and mercury contamination of fish downstream shall be discussed. The Proponent shall do the same with respect to marine mammals and piscivorous birds. It shall determine the duration of the contamination, taking all sources of leachate into account (soil, vegetation, etc.).

In the discussion of Manitounuk Sound and Hudson Bay, the Proponent shall deal with the transfer and bioaccumulation of methylmercury in the food chain, including plankton, invertebrates, and marine mammals, for the variants being considered for the tailrace.

The impact of the Great Whale complex with regard to increased human exposure to methylmercury shall also be considered. The following issues must be considered:

- evaluation of exposure levels and their distribution over time in terms of the various assumptions made in determining methylmercury bioaccumulation. These assumptions and the ecological basis on which they are founded must be clearly identified. The following elements in particular must be dealt with:
  - the pharmacokinetic behaviour of methylmercury in humans, including the selection of models linking consumption to physical indicators of concentration (e.g. blood, hair);
  - the neurotoxicity of methylmercury in the adult population in terms of exposure levels and duration, including the cumulative effects of long-term exposure;
  - the *in utero* neurotoxicity of methylmercury in terms of exposure;
  - the existing epidemiological information pertaining to the evaluation of neurological effects produced by exposure levels and similar anticipated hazards in the context of hydro-electric development.
  - the changes in human exposure levels since 1975 (with separate categories for villages, sexes and age groups);
  - the availability of *in utero* exposure data, as well as follow up studies on the long term effects from *in utero* exposure;
  - in light of existing ecological and pharmacokinetic information, the assessment of probable exposure rates among various social groups, taking into account the time factor;
  - the estimated risk for the adult populations associated with this exposure;
- the estimated *in utero* neurotoxicity hazards associated with this exposure.
- identification of the various scenarios for the use of wildlife resources by the various groups concerned;

- study of the measures that would be required to meet certain human exposure standards considered acceptable in this context, including a description of the criteria employed and their justification in terms of public health;

Insofar as the accelerated bioaccumulation of methylmercury in fish and potentially in marine mammals will call for control of Native fishing and hunting activities, or will raise concerns among the population regarding the toxic effects of methyl mercury, there will be a need to deal with social and cultural issues linked to changes in lifestyle diet, etc. due to methylmercury in the environment. The special importance that Inuit and Crees attach to the procurement, enjoyment and nutritional value of country food was emphasized strongly throughout the scoping hearings conducted from January to March 1992. Country food is perhaps the most tangible evidence of the intimate and spiritual relationship with nature that the Inuit and Crees described often;

The Proponent shall study the experiences of other Native communities affected by mercury contamination (both in and outside of Quebec) to determine the potential social and cultural impacts relevant to the Great Whale complex impact assessment study.

The following areas are to be covered:

- the distribution of exposure level categories in relation to the composition of Native communities and territorial organization of fishing activities;
- the changes in exposure levels since 1975 and the degree of risk perceived by the various groups concerned;
- the harvesting, distribution and consumption of fish, marine mammals and birds, taking into account information gathered on the study of exposure to mercury among the population;
- past experience with monitoring of exposure among pregnant women and women of child-bearing age;
- problems with language or comprehension in implementing information programs for users of these resources.

Finally, and in light of the foregoing, the Proponent shall define the social intervention strategy it considers most suitable under the circumstances and the resources required to implement and periodically review the measures in question. In this context, the Proponent must propose a strategy of ongoing dialogue and consultation between the Proponent and the affected populations as well as those government agencies involved.

5.3.0 Impacts on health

Although the impacts resulting from mercury contamination are of critical importance, it nevertheless appears important that impacts on health not be limited to this component.

In addition to mercury related studies, a global study on health is required. In the past several years, in Quebec and elsewhere, analytical research has been undertaken on Northern populations that could be pertinent to the study of the milieu and the impacts of development. The case of the impacts of the La Grande project on the physical and mental health of the Chisasibi population serves to confirm the extend to which projects of this kind may affect the health of communities.

The Proponent shall therefore proceed with a study on health based on an anthropological approach taking into account the impacts of the project on social cohesion and on individual health.

It will be necessary to evaluate how the feeling of loss of control and identity as well as the fear of not having sufficient resources could lead to the creation of personal and social problems and a general deterioration in the state of health. In this context, perceptions that people may have with respect to health are pertinent to the analysis of this subject.

In this type of study, it is important to determine, with the aid of resource people in the community, what action could be taken to reduce, if not eliminate, health related problems. Study target groups should be identified.

Within this framework, the Proponent should evaluate the following factors:

- the collective and individual state of health of the communities under study;
- a prediction of the effects of the project on the health of individuals and a study on the stress that will result from the numerous changes;
- the presence or absence of organizations involved in the field of health, the identification of internal community resources, places where action is possible, etc;
- the work of community organizations in terms of preventive activities, and awareness and education programs;
- action that could be taken to enhance personal and community well-being (taking into account formal and informal resources);
- the possibility of contamination other than those cases already known;

- the consequences of magnetic fields and high voltage lines on humans and animals, taking into account recent studies on this topic and the concerns that have been expressed.

In the context of this study, the Proponent should try to avoid a simple description of social and health services. It is also important to avoid and trivializing the work of community groups and the way in which people perceive and define health to the level of folklore.

Finally, the Proponent should consider the possibility of supporting initiatives to consolidate existing networks in addition to respecting the philosophy of intervention and conceding decision-making powers to the people primarily affected, that is to say, community members, particularly those intervening in, or preoccupied by health related questions.

5.4.0 Diet

The question of diet is at the center of the well-being of all cultures and often serves to define and distinguish them and to ensure the survival and evolution of a group. It therefore appears essential that the diet of the affected communities be studied. This was a major concern raised in the course of the public consultations. The history of the affected communities will provide information on diet-related issues as periods of scarcity, even famine that have occurred in these communities, and have shaped attitudes with respect to food and contributed to the development of a component of social life which is centered around food and food sharing.

The proposed Great Whale project, if approved, could cause certain changes in diet by inhibiting the pursuit of traditional harvesting activities during construction. Some hunters will no doubt find construction work, and once the project is completed, the amount of productive land for traditional pursuits will have been reduced. Moreover, some of these lands will be subject to forms of contamination. For these reasons, the question of diet merits special consideration.

The price of food in northern communities, the monopoly of certain retailers, the low quality of food and the distribution of foodstuffs low in vitamins and protein are important factors to consider. Native peoples have different dietary habits; as a function of their particular metabolism, the absorption of elements essential to their bodily functions come from foods which Southern inhabitants are not generally accustomed to and are not familiar with. For this reason, changes to their dietary habits could have negative repercussions on the health of individuals. The caloric intake of the individuals of the region must differ from those of Southern people due to the climate and activities of individuals such as hunters. Furthermore, it is difficult for people to change their dietary habits, and in this case the significant spiritual value of certain consumable animals must also be considered.

For all of the aforementioned reasons, and considering each of these factors, the Proponent will proceed with a study to analyse the questions related to diet. Elements such as contamination, the percentage of "traditional" food in the diet of Native people, access to resources of the territory, reduced resource availability and individual resistance to changes in dietary habits should be studied in an analytical fashion.

5.5.0 Land use

Using the available data, and adding to them if necessary, the Proponent shall evaluate the foreseeable repercussions of the project on the land use patterns of Native and non-Native peoples.

Land use includes several elements. It is not sufficient to simply provide a list of harvesting areas, activities and most-sought-after species. The Proponent should integrate data on land use in the region into other components of the social milieu, within the institutional framework of the James Bay and Northern Quebec Agreement.

Present and potential land use by Native people for trapping, hunting, fishing and gathering shall be considered. Special attention shall be given to land use along Manitounuk Sound in relation to the distribution of major resources and their use by the inhabitants of Kuujjuarapik/Whapmagoostui.

All studies on land use should have two components: the construction of the project and, operation of the completed project. The construction phase should not be neglected.

The land use study will include the following elements:

5.5.1 Movement on the territory

The main routes presently used should be studied by taking into account the seasons and transportation methods (boats, canoe, skidoo, airplane, etc.) since certain components of the project could modify the use of certain circulation routes. In considering these types of data, the Proponent will evaluate the impacts on circulation routes during the construction works and after the implementation of the project, if approved.

The Proponent shall evaluate the increase in hunting, fishing and trapping costs created by the project; (the necessity of using an airplane rather than a skidoo or a boat to reach an area, for example). The Proponent shall also evaluate the distances that must be travelled in order to access different harvesting areas, taking into account modifications to routes. On the other hand, the addition of new roads may create opportunities for access to new harvesting areas.

Travel on watercourses and reservoirs during the winter (ice conditions) and during the summer (waterflow, depth and presence of debris) should be evaluated. Particular emphasis will be placed on Manitounuk Sound, the Bienville reservoir and the River estuaries, particularly the Great Whale River estuary which appears to be the only place to dock boats during the summer in Whapmagoostui/Kuujjuarapik.

5.5.2 Land occupation

In the study on land use, the Proponent must assume that all of the territory is occupied in a continuous fashion, even if certain portions of the territory appear unoccupied at the time the studies are done.

In this context, the prospect for replacement areas to ensure the continuation of traditional activities must be evaluated.

The project will have particular impacts with respect to traplines. The Proponent shall therefore identify construction activities that will take place on each trapline and evaluate their cumulative effects. Furthermore, the Proponent shall evaluate how the impact on an individual's trapline could affect the community, namely by displacing the individual to another trapline and sharing of game in the community. Taking into account the modification and reductions to the land, the Proponent shall evaluate the increased competition that could result among different users. A study of the possible land use displacement towards the north and the south most be undertaken. Native participation in this study is desirable. The Proponent shall consider how changes to the landscape will affect competition for lands in harvesting activities. This competition could take place between members of different communities as well as between Natives and non-Natives.

5.5.3 Drinking water in the region

The Proponent shall clearly identify every watercourse that will be affected either directly or indirectly by the project, while specifying the quality of drinking water.

Moreover, the Proponent shall assess the impact of the Great Whale River diversion on the drinking water supply for the communities of Kuujjuaraapik/Whapmagoostui.

5.5.4 Gathering activitiess

Impacts on the activities related to gathering plants and berries must be evaluated, particularly under transmission lines if chemicals are to be used to control vegetation growth.

5.5.5 Recreational and family activities

The Proponent shall also take into account the impacts of the project on family and recreational activities.

5.5.6 Population movements

The Proponent will evaluate the possible displacement of groups of individuals. If the project is built, individuals or groups of individuals living in Whapmagoostui/Kuujjuarapik might consider the possibility of moving to other communities such as Umiujaq, Inukjuak, Sanikiluaq or elsewhere. If the opposite is true (the project is not built), individuals or groups of individuals, particularly those in Umiujaq, might consider returning to Kuujjuarapik.

5.5.7 Archaeology

The Proponent shall provide an overall assessment of the current status of knowledge of the archaeology of the area under study and the consequences which the project will have on it. The Proponent must ensure that archeological tests have been undertaken on all principal sites where development and infrastructures are proposed. (including dams, reservoirs, roads, airports, etc.) in order to allow an adequate characterization of impacts.

5.6.0 Opening of the territory

This section shall include an analysis of the social impacts from all the roads and airport infrastructure, and more specifically of increased access to Kuujjuarapik/ Whapmagoostui. The following elements are to be considered:

- identification of what will be modified and what will not be changed with regard to the social life of the territory's current inhabitants (economic life, family, political and spiritual life, etc.);

- impacts on the cost and availability of goods and government services. The absence of competitors, if such is the case, will also be noted;

- effect on the transportation costs to the hunting, trapping, fishing, gathering areas (air transport in relation to road transport, effect of substituting land transportation for bush aircraft, boats, canoes, and snowmobiles, etc.);

- a study of the impacts on transportation costs with respect to the use of future access roads to reach hunting, fishing, trapping and gathering areas. This study must take into account the revenues of users during and after the project, particularly for those practising these activities on a full time basis. The study shall also consider means of transportation to a territory and activities within it. Would road vehicles effectively replace other means of transportation or would they serve principally as a complement?;

- the Proponent shall describe how all the access roads will be maintained both during and after the project. Climatic data shall be considered, particularly during winter when the use of vehicles for long trips is required;

- undesirable impacts such as road accidents involving humans or wildlife, noise, dust, theft and damage to hunters' equipment must be considered;

- in the context of land use, the Proponent shall give due consideration to caribou migration routes, since caribou are an important resource;

- the foreseeable impacts of the use of the new access roads built by non-residents of the territory for sporting or tourism purposes;

- the foreseeable social repercussions of the economic development (opening up of the territory, mining industry, outfitting camps, etc.) made more probable by the creation of this road infrastructure;

- increase in alcohol and drug problems, since importation of these substances into the area will be facilitated by the road;

- respect for rights defined by the James Bay and Northern Quebec Agreement;

- the impacts on Category I and II lands;

- the impact study will also take into account the impacts on land use by the Native peoples of establishing a corridor eight miles wide as mentioned in Section 4 of the James Bay and Northern Quebec Agreement. The Proponent shall indicate its need for this corridor;

- the Proponent shall evaluate the social and cultural repercussions on Native communities of the presence of large numbers of non-Native workers and tourists;

- particularly for the airports, the Proponent shall assess the impacts on area residents during construction and operation:

  - on hunting

  - on their quality of life (noise, dust)

  - on air service quality during construction, and on regional development, indicating how they are to be integrated.

The impact study shall also include an analysis of driving effects on the territory created by a road link between Kuujjuarapik/Whapmagoostui and any other development activity. The Proponent shall outline the probable consequences, in the medium and long terms, of opening up this community or of continuation of the present situation. This comparative study will be prepared in consultation with the Native communities and organizations or departments involved.

During preparation of this section, it is strongly suggested that the Proponent collaborate closely with the communities of Kuujjuarapik/Whapmagoostui. It is recommended that the Proponent take advantage of and discuss the experience acquired following the opening up of other communities in Northern Quebec (e.g., Chisasibi), on the Lower North Shore and elsewhere in the country.

Access roads shall be considered as a whole in order to evaluate as accurately as possible the impacts associated with them. The project's evaluation will, however, also enable its major components to be assessed (e.g., north-south and east-west access roads, airports, etc.).

The banks of the Manitounuk Sound and of adjacent sectors play an important role in the means of subsistence of the Cree and Inuit communities of Kuujjuarapik/ Whapmagoostui. All the proposed access infrastructures mentioned earlier could significantly affect the behaviour of waterfowl in their feeding and resting areas on the shores of the Sound. They could also affect other wildlife resources, both aquatic and terrestrial, on which the Natives depend. Thus, the study of the access infrastructures shall include an assessment of the cumulative impacts of each of the variants. It shall also include mitigative measures applicable to each of the scenarios under consideration.

Finally, the evaluation of routes shall take into consideration the possibilities for the establishment of a solid waste disposal site for the communities of Kuujjuarapik/ Whapmagoostui.

5.6.1 The role of the Proponent with respect to the opening of the territory

The impact of the influx of sport hunters and fishermen during and after construction, whether visitors, tourists or workers, will be evaluated, particularly in the context of the opening up of the community of Kuujjuarapik/ Whapmagoostui and the increased accessibility of the territory used by Native peoples for their subsistence activities. In this respect, the Proponent shall refer to the experience acquired in the James Bay region during and after the construction of the La Grande Complex, and discuss the problems encountered and the solutions that have been identified.

In light of the fact that the Proponent will play an important role in the development and opening up of the territory, dialogue strategies that could result in mitigating undesirable impacts caused by the opening up of the territory should be anticipated and planned with the appropriate government departments.

In the same spirit, and with respect to the opening of the territory to outside sport hunters and fisherman, the Proponent shall study wildlife and fish harvesting activities to determine the combined effects of opening the territory and the reduction of land in terms of acreage and productivity.

5.7.0 Social and economic impacts

5.7.1 Economic spin offs

The Proponent shall describe the economic spinoffs of the project that will be derived from the sale or rental of goods and services both locally and regionally and for Native owned companies.

5.7.2 Employment

The Proponent shall also evaluate the number of jobs that will be created according to job categories, length of employment, training and experience required as well as salaries for workers from Native communities, from adjacent regions such as the Abitibi-Temiscamingue, Radisson, Matagami, Chapais, Chibougamau, Lac St-Jean, and from the rest of the province.

The Proponent shall present the anticipated pay rate, particularly with respect to the alternation of working days on the site with leave taken elsewhere for all workers, whatever their origin.

The Proponent shall also provide all pertinent data concerning training programs. In addition, the Proponent shall evaluate potential problems related to the training, and in particular the classification of Native workers.

An estimate of the percentage of Quebec construction workers that will be hired will be presented, including employment directly related to the construction period as well as employment once the project is completed.

Direct and indirect costs (lodging infrastructure, transportation, food, etc.) of employment will also be described for this type of project in the north.

With respect to workers from Native communities, the Proponent shall evaluate the long-term employment opportunities during the post construction phase.

In the light of the experience gained from the La Grande Complex, Native perceptions of employment opportunities for this type of project will be analysed. The following question should be addressed: what are the profiles of Native people likely to be employed (age, sex, education, training, experience, type and length of employment)? What are the profiles of those not likely to obtain employment opportunities?

5.7.3 Data on migrant workers

The Proponent shall provide the following data with respect to migrant workers:

- place of origin;
- working conditions;
- working conditions on campsites;
- relation with Native peoples;
- harvesting activities (fish and wildlife);
- percentage of men and women in each campsite;
- accidents in the workplace.

The Proponent shall evaluate the impact of the migration on workers and their families, using data available (from Hydro Quebec and the unions) concerning workers who have been employed for similar projects. The Proponent shall also conduct semi-structured interviews with these workers and their families. The workers interviewed will be selected from a sample of workers employed by the La Grande Project. The sample should reflect the typical characteristics of employees (origin, sex, age, type of work).

An analysis of revenues before, during and after the construction of the project appears essential.

In addition to these data, the Proponent shall analyse the pathological social impacts related to this type of project and to the isolation of workers from their family and social milieu. In order to do so, the Proponent should consult the workers, their families, their social network and persons from Native communities.

5.8.0 Impacts on the biotic environment

5.8.1 Freshwater seals

In light of the flow reductions being considered (preliminary information, October 1991) in the Nastapoka basin, the Proponent shall assess the impacts that these reductions, and the project in general, will have on freshwater harbour seal populations. In particular, it shall examine the preferred habitats, recruitment, diet and genetic status of the seal population of the Loup Marins Lakes. It shall also assess the changes to the limiting factors that already affect this population and estimate the ecosystem's durability in the face of the physical and biophysical changes which could be caused by construction.

5.8.2 Whales

Based on the knowledge of the ecology and distribution of marine mammals in the region, the Proponent shall, for the different possible scenarios, discuss the impacts of changes in the ice regime, as well as the physical, chemical and biological changes to the ecosystem on the whale herd. Specifically, it shall discuss the extent of habitat loss and the herd's reproductive cycle (particularly the calving areas and nurseries), diet and movements. The Proponent shall discuss the impact of its project on the beluga whale, taking into account the harvesting of such whales by Native people.

The Proponent shall take into account the protection status being considered for these species and habitats. It shall indicate how these statutes or state-of-the-art knowledge have influenced the proposal to divert the Little Whale River.

5.8.3 Rare, vulnerable and threatened species

The Proponent shall identify the potential impacts of the project on the rare, vulnerable and threatened species, and present possible solutions for safeguarding or relocating them. The report should include such items as the particular ethology of the species concerned and the factors limiting their distribution. Furthermore, the Proponent shall discuss the likelihood of extinction or weakening of rare or threatened animal or plant species from a specific area or the region in relation to various project options.

5.8.4 Transfer of species and parasites

The Proponent shall assess the risk of fish species migrating from one drainage basin to another or from one lake to another as a possible consequence of the hydroelectric development. If such a risk exists, the Proponent shall assess the impact of such transfers on indigenous species. The Proponent shall also assess the likelihood of new parasites being introduced into indigenous aquatic organisms and their impact on intermediate and final hosts.

5.8.5 Caribou

In its impact assessment, the Proponent shall use results from studies done on the La Grande complex and similar projects to assess the influence of these hydroelectric developments on caribou migrations and changes in habits and habitats during and after construction of the installations. The Proponent shall also consider the preferred areas of use and migration corridors, in terms of the risk of accidents for caribou as well as the use of the resources themselves.

5.8.6 Avifauna

The Proponent shall evaluate the abundance, the distribution and the seasonality of bird species in the territory and evaluate the impact of habitat losses for these species, notably for migratory birds and waterfowl. The Proponent will evaluate modifications to the littoral habitat which will result from the filling of reservoirs. The Proponent shall estimate the value of lost nesting, staging, feeding and rest areas for avifauna in general and for waterfowl in particular. The Proponent shall discuss current knowledge concerning use of the east coast of Hudson Bay by waterfowl as well as of Manitounuk Sound, and shall give special attention to species of interest to Native people, notably the eider duck, the ptarmigan, the Canada goose, the white geese, etc. Moreover, the Proponent shall evaluate the impacts on flyways in the study area, notably those near Kuujjuarapik/Whapmagoostui during construction works and after the implementation of the project, should it be approved. Finally, the Proponent shall make prediction regarding possible increases in hunting pressure attributable to the opening up of the territory to southern hunters, and the consequences of such pressures for migatory birds and waterfowl.

5.9.0 Impacts on the abiotic environment

5.9.1 Decomposition of flooded organic matter

Given the increased water levels and the large areas of land flooded, the Proponent shall estimate the amount of carbon introduced into the aquatic ecosystem as a function of depth. The Proponent shall also estimate the amount of CO_2 and methane released during decomposition of flooded organic matter, comparing these quantities with those recorded at the La Grande complex and other hydroelectric complexes in the northern hemisphere. The impact of deforestation (prior to impoundment of reservoirs) on the biochemical cycle of mercury and on the use of reservoirs after impoundment must also be considered.

5.9.2 Climate

The Proponent shall examine the impact of the project on local and regional climate (precipitation, temperature, fog, etc). In doing so, it shall consider the impact of changes to water (estuaries, reservoirs, lakes and rivers) and ice conditions.

5.9.3 Permafrost

Based on permafrost distribution data, the Proponent shall assess the impacts of flooding caused by reservoirs. The Proponent shall assess the risks of subsidence and erosion due to the melting of permafrost along the edges of rivers affected and newly created reservoirs.

5.9.4 Works safety

The Proponent shall deal with the possible consequences for users of the territory of construction, start-up and operation of works. In particular, attention should be paid to the perceived risks and emergency plans to be implemented in the case of rupture of storage structures, and the information, follow-up and surveillance programs required. The Proponent, shall, in this regard, also deal with the impact which the construction of reservoirs could have on the seismicity of the region.

5.9.5 Fires

The Proponent shall estimate the potential loss due to fires caused by construction and operation activities brought on by the development of the complex. A retrospective assessment of the origin and repercussions of fires in the Great Whale area would be useful in this respect. In order to do this, an inventory and a classification of the origin of fires registered by the Société de Conservation du Nord-Ouest should be available.

A fire surveillance and control program shall also be presented in the impact statement.

5.9.6 Navigable waters

The Navigable Waters Protection Act sets out the obligations of a Proponent whose planned projects will have an impact on the navigability of the watercourses developed. The Proponent shall present an inventory of navigable watercourses which may be affected by development of the hydroelectric complex, evaluating changes to the navigability of watercourses in the region which will be brought about by the project and analysing the water levels and critical flows which permit navigation according to the development variants of the complex.

The Proponent shall present data on the use of navigable watercourses by Native communities (rate of use, seasonal use, etc) and alternatives to navigation in cases where corrective measures would be insufficient to ensure the navigability of affected watercourses. Finally, the Proponent shall indicate at what time it intends to apply for the required authorizations from Transport Canada in relation to the Navigable Waters Protection Act.

5.10.0 Impacts on the aquatic environment and its use

5.10.1 Modifications to river sections and reservoirs

Riparian habitats will be greatly affected by the flooding or daylighting of rivers and lakes. The amount of habitat lost will depend on the variants, sub-variants and the method of managing the reservoirs selected. The Proponent shall submit comparative studies on the different possible variants, sub-variants and methods of managing the reservoirs in light of habitat area, wildlife productivity and rare or significant plants that will be lost.

For each possible scenario, the Proponent shall also describe the changes to the shoreline and littoral habitat resulting from the impoundment of reservoirs GB-3, GB-2 and GB-1. The Proponent shall assess the anticipated changes in the extent of erosion and sedimentation during and after construction.

The Proponent shall estimate the value of the lost nesting, breeding, feeding and staging grounds for avian species in general and waterfowl in particular. It shall also estimate the habitat loss for terrestrial fauna and interpret the results in light of the value of riparian habitats for these species and the effect on the harvesting of these species.

The impacts on aquatic fauna in terms of the quality of the modified habitats (flooded or daylighted areas), specific composition and productivity shall be assessed.

In the case of river sections where flow is to increase or decrease, the Proponent shall estimate the effect of these changes on erosion, sedimentation, water quality and ice conditions and the phytoplankton and zooplanktonic and benthic communities that characterize them. The Proponent shall assess the loss or gain of habitat in relation to the various flow level scenarios under consideration.

The Proponent shall report on its predictions concerning the distribution of dissolved oxygen in the winter in relation to forebay and reservoir configuration, flooded vegetation and water depth. Particularly attention shall be given to the stability of water masses low in oxygen in future reservoirs.

The Proponent shall assess the impact of creating reservoirs, particularly on the following: the accumulation or availability of toxic substances from endogenous and exogenous sources, the evolution of fish communities, taking into account operating criteria, as well as spawning and egg maturation conditions; growth rates as a function of population dynamics and changes in mortality, fecundity and reproductive age and variability in age-class representation. Wherever possible, the role played by the configuration and operation of the reservoirs in fish population dynamics must be examined. Those aspects of the aquatic ecosystem required to evaluate conditions downstream from the diversions are also to be specified, including the various scenarios being considered for maintaining residual flow.

5.10.2 Modifications to Lake Bienville

Lake Bienville is an area of great importance to the region's wildlife. The amount of prime wildlife habitat lost will depend on the size of the reservoir created. The Proponent shall conduct a comparative analysis of habitat loss and of decreases in wildlife productivity for the region. This comparison is required for the different possible operating levels of the Lake Bienville reservoir and the different reservoir configuration scenarios.

In addition, the Proponent shall, for the different scenarios, estimate the effect of submergence on the factors limiting the wildlife populations found in this area. Considerations should include the importance of the reservoir impoundment period and fluctuations in water levels. The analysis shall deal more particularly with the waterfowl and caribou that make use of the area at one time or another of the year.

With regard to aquatic fauna, the Proponent shall discuss the anticipated changes to the habitats, as well as specific composition and productivity.

5.10.3 Modifications to estuaries

The flow reduction in the three estuaries mentioned above will have an impact on the physical and biological environments. In this context, the Proponent shall estimate the effects of the different possible project scenarios. More specifically, the Proponent shall:

- assess the role of river flow in maintaining estuarine ecosystems to set seasonal flow requirements in instances where a controlled flow will be used as a mitigative measure;

- present predictions concerning the behaviour of the three estuaries after the completion of the Great Whale complex with regard to erosion, salinity patterns, freshwater plumes and changes in temperature, turbidity and the transport and deposition of sediment, as well as bathometry and physical and chemical aspects. A mathematical model incorporating all pertinent parameters should be developed to reproduce current and future conditions for each estuary with regard to water circulation, temperature and salinity for an annual cycle based on various scenarios, both natural and modified by the project. The influence of resulting changes on tides, ice and sediment shall also be considered in the model. The significance of multi-year variations in the natural flow of rivers, sea ice and the characteristics of the coastal waters of Hudson Bay shall also be considered. The Proponent shall justify the choice of the model retained.

- assess the habitat loss for marine fish and organisms and make predictions as to the possible changes in specific composition. Explain the effect of the physical and chemical changes on the ecology of fish larvae and the recruitment of anadromous fish.

- assess the effect of winter water conditions, including modifications to freshwater flows in coastal areas, on the reproductive success and habitat availability of fish that naturally use the estuaries in the winter.

- discuss the effect of changes in flow on the use of estuaries by marine mammals, particularly in the Little Whale River, and explain the effect of possible changes in temperature, bathometry and prey availability.
- evaluate the significance of the GB-1 spillway on the physical, chemical and ecosystemic elements mentioned above.

5.10.4 Modifications to the ecology of Manitounuk Sound

Manitounuk Sound could be affected significantly by the increase in freshwater flowing into it. In order to facilitate analysis of the impact of the project on Manitounuk Sound, the Proponent shall incorporate its observations on the area into a three-dimensional mathematical model which will consider stratification, tides, ice, wind and bathometry to reproduce water circulation, temperature and salinity on a monthly and seasonal basis. The effects of increased freshwater supply in the Sound on tides, ice cover and local bathometric conditions shall be considered in the model. Forecasts based on the model and other pertinent data should be used to estimate the influence of the freshwater supplies on the marine environment, including biological and chemical factors, sediment, suspended matter and the ice cover. This modelling should enable the Proponent to evaluate the chemical and biological consequences of the changes to the vertical and horizontal exchange mechanism, and discuss the effect of the tailrace at the GB-1 generating station on this process. Given the anticipated impacts, the Proponent shall include an explanation of the accuracy and limits of the model or models used to make these predictions and analyze the following items:

- the Proponent shall make predictions concerning the impact of the project on ice-free areas (polynyas), in particular in terms of productivity, mercury contamination accummulated in mammals, and user safety;
- the Proponent shall study the impacts on the composition and distribution of ice and the dynamics of freezing and thawing.
- the Proponent shall indicate the impacts of the different strategies under consideration on sedimentology, primary production including ice algae, shellfish, fish, waterfowl and marine mammals. The Proponent shall assess the impact of the project on anadromous fish in the estuaries, and describe the influence of winter hydrologic conditions on spawning success and habitat. It would be useful to present a forecast

or a well founded hypothesis and to identify the data necessary for this verification.

- the Proponent shall define the ecological objectives for the GB-1 station's spillway optimization and assess various scenarios of vertical and horizontal exchange between fresh and saltwater in relation to the location and the configuration of the spillway. The Proponent shall present a forecast of the impacts on ice-free zones, notably in terms of productivity and user safety, and highlight the implications of the various scenarios under consideration for sedimentology, primary production, shellfish, fish, waterfowl, marine mammals and on the composition and distribution of ice;

- the Proponent shall evaluate the impact of the choice of load factor on the considerations mentioned above;

5.10.5 Consequences for Hudson Bay and the Belcher Islands

Environmental concerns with regard to the Great Whale project extend to Hudson Bay and its Native peoples, particularly the Inuit community of Sanikiluaq, on the Belcher Islands. This community depends largely on fish and game as sources of food. Aside from caribou, polar bears, ptarmigan and wildfowl, most of the food traditionally available on the Belcher Islands comes from anadromous or marine species. These include, in particular, Arctic char, cod, molluscs, seals, walrus and Beluga. Access to these food sources, which are also used by the communities of Kuujjuarapik/Whapmagoostui, Umiuaq and Inukjuaq, may vary enormously according to the time of year and environmental conditions.

The environmental impacts of the Great Whale project on wildlife and marine resources should be the object of special attention on the part of the Proponent. The Proponent shall anticipate long-term changes in the marine environment resulting from the project. What will the impact be on marine currents, physical and chemical properties of water, and the formation, movement and break-up of ice? How will these changes affect fish, birds, seals, belugas and other forms of marine life? What impacts will diversion of rivers and variations in flow in the estuaries and Manitounuk Sound have on the biological productivity of Hudson Bay? Will the modifications have an impact on the ecosystems of Hudson Strait and the Labrador Sea?

To what extent will additional quantities of methylmercury and other contaminants enter the marine environment? What were the levels of contamination of marine mammals prior to 1978? To what extent will molluscs and fish, wildfowls and marine mammals be contaminated by bioaccumulation? Will it influence the behaviour and migratory routes of birds, fish and marine mammals? What will be the critical levels of contamination of the various species in terms of human consumption? How accurately can the rate of contamination of the marine environment and its wildlife resources be predicted? These are questions to which the impact assessment statement must provide adequate answers.

5.11.0 Related infrastructures

The Proponent shall evaluate the impact of construction and operation of each of the related infrastructure (access roads, borrow pits, camps and airports) required for the complex.

The Proponent shall particularly highlight the physical problems that may result from the construction of access roads. The following items shall be dealt in detail:

- modification to the natural flow characteristics of the waters as well as to land drainage;
- impacts on the land, slopes and cleared areas in terms of erosion, gullying and carrying off of organic soil;
- impacts of work carried out in watercourses and of the facilities on the life cycle of species present (spawning, larva survival, modification to the quality of water, etc.);
- impacts of the work and facilities on the terrestrial fauna, and more specifically on the loss of habitat and the displacement of the animals.
- impacts on the quality of life of the residents especially from the noise and dust generated that can constitute a nuisance to the possibility of integrating the proposed project to community or regional development during hunting or during other traditional activities.

5.12.0 Impacts of the collector system

The Proponent shall discuss and evaluate comparatively the corridors to select one or several preferred corridors within the study areas. The Proponent shall identify the criteria and concerns leading to selection of the corridors studied. The Proponent shall highlight the advantages and disadvantages of each corridor from environmental, social, technical and economic viewpoints. The impact of planned changes to the Radisson and Chisasibi stations, as well as other existing installations in the transmission system, shall also be evaluated, as need be. This phase will also take into account the results of communication with the populations and organizations concerned.

The Proponent shall evaluate the consequences of electromagnetic fields related to these high tension lines on humans, animals and vegetation, taking into account current knowledge on this subject and concerns of the local populations.

Finally, the Proponent shall demonstrate the validity of its choice and shall describe the environmental and social impacts created by the corridors selected.

5.13.0 Cumulative impacts

Many of the changes that will take place in the area of the project have already been identified. Environmental concerns have been raised regarding their cumulative impacts resulting from the components of the project itself and from other projects, planned or existing, in the James and Hudson Bay bio-region. For this reason, the impact study must include an evaluation of the adaptability and tolerance of the environment to the succession, addition, repetition and interaction of many projects and activities, interacting in time and space.

The Proponent shall therefore analyze the ecosystemic consequences of adding another hydroelectric complex to those already existing or under study in the James Bay and Hudson Bay region. The objective of this exercise is to encourage the preparation of strategies to allow the integration of the project into the environment in a harmonious and sustainable manner.

5.13.1 Definition

Cumulative impacts are those effects which result from a series of additive or interactive interventions in a social or biophysical environment over time and space. The concept of additive interventions relates to the accumulative interventions or the augmentation of interventions which are added to others both past and present. Interactive interventions are those which may be combined with others in a synergistic manner or which result from the combination of several factors or interventions acting concurrently upon a given element.

5.13.2 Objectives

The objectives of the part of the impact study dealing with cumulative impact are as follows:

- to study and present the cumulative impact of the project itself on the social, economic and biophysical components;
- to study and present the cumulative impact of the Great Whale project itself in relation to other projects, existing or under study, in the James and Hudson Bay bio-region and in terms of the social, economic and biophysical components of the environment which could be affected;
- to propose and implement strategies to control the results of identified cumulative impacts, over the short, medium and long terms, so that the project can be integrated into the environment in a harmonious and sustainable manner.

5.13.3 Suggested methodology

While some recommendations will be made to the Proponent with regard to methodology, the Proponent shall propose its own definition of cumulative impact and present the method which it favours.

The Proponent shall study these cumulative impacts from the viewpoint of existing references on the subject, including the CEARC series (1986, 1987, 1988), Davies (1991) and Baskerville (1986), Contant and Wiggins (1991), and the work of the Canadian Arctic Resources Committee. We would ask the Proponent to consult the documents previously cited and, using these tools or other similar methods, analyse the impact of the Great Whale, La Grande and NBR complexes on the environment in the larger sense. The case study of the impact of northern development on traditional use of resources (additive impacts, increasing impacts, discontinuous impacts, unforeseen structural impacts) (CEARC, 1988) could be an important source of inspiration.

Once the cumulative impact is clearly understood, an ecosystemic rather than an analytical approach to the evaluations carried out by the Proponent should be favoured. Thus, the historic analytical process must be abandoned and a holistic approach to the exercise taken. Links must be established among the cumulative effects on the various ecosystems affected, directly or indirectly, positively or negatively, by the project.

Faced with these facts, and given the high quality of data and activities accumulated on the project, it is recommended that the Proponent make a methodological effort to reduce the social, economic, ecological and biophysical variables which are deemed significant to the most elementary measures of the main concerns of the populations in question (Northern and Southern Quebec) (for example, integrity of landscapes and hydric regime; climatic stability; mercury concentrations, etc).

Based on this approach, it would appear that cumulative impact comes from three sources: from the Great Whale project itself; from the combination of the impact of Great Whale and those caused by other, existing, hydroelectric complexes in the James and Hudson Bay bio-region and; lastly, from complexes which border this bio-region and exercise an influence on a broader scale.

5.13.4 Cumulative impact of the Great Whale project itself

In this section, the Proponent shall examine the cumulative impact of the Great Whale project on an individual basis. The evaluation shall deal particularly with the following aspects, for both the construction and operation phases of the complex. The list which follows is not exhaustive and the Proponent is invited to add to it in light of its studies.

Manitounuk Sound and the Kuujjuarapik/Whapmagoostui region:

- the Proponent shall study the cumulative impact on the social fabric of road traffic and the opening up of Kuujjuarapik/Whapmagoostui;
- the Proponent shall study the cumulative impacts in Manitounuk Sound and int he Kuujjuarapik/Whapmagoostui region resulting from the construction of the GB-1 complex and the construction and use of roads and airports on human populations, migratory birds and caribou;
- the Proponent shall study the cumulative impact of changes to the hydric regime on aquatic wildlife (invertebrates, fish, mammals) and ice, particularly in the area of the tailrace canal and the outlet of the Great Whale River into the Manitounuk passage. A three-dimensional

mathematical model shall be presented on modifications to the freshwater supply of Manitounuk Sound;

- the Proponent shall study the cumulative impact of the presence of an ice-free zone in close proximity to the GB-1 spillway, in Manitounuk Sound, on the eventual increased use of this zone by marine mammals and the mercury contamination which could result;

Use of the territory :

- the Proponent shall study the cumulative impact of flooding on the subsistence trapping, fishing and hunting (caribou migration) of the Native population of Kuujjuarapik/Whapmagoostui. Will physical changes to the territory lead to the displacement of humans and animals, or to domino effects on other populations;
- the Proponent shall study the cumulative impact on wildlife and habitats of the opening up of the territory and the development of the complex, taking into consideration the productivity of the environment as well as current and future pressure for development. Emphasis shall be placed on aquatic and terrestrial wildlife resources on which Native communities depend;
- the Proponent shall evaluate health risks (herbicides, electro-magnetic fields, etc) following installation of new electricity transmission lines. Particular attention shall be given to human, animal and plant communities where collector network lines will be located.

5.13.5 Cumulative impact of the Great Whale project and other projects

It is very likely that the environmental impact of the Great Whale project will combine with the impacts of other, similar, projects, existing (La Grande, Churchill-Nelson) or under study (NBR, Moose River, Conawapa) in the James and Hudson Bay region of Quebec, Ontario and Manitoba.

In this regard, the Proponent shall study among other things, the following cumulative impact in the James and Hudson Bay bio-region, including the Belcher Island:

- related to the addition of new mercury-contaminated environments and the effects on Native communities and subsistence fishing and hunting resources in the bio-region;

- changes to regional economy and lifestyle of populations of the opening up of new territories and the construction of new hydroelectric complexes. For example, the Proponent shall look at the question of the consequences for Cree and Inuit populations, insofar as such changes are attributable in whole or in part to the project, of changing from a subsistence to a money-based economy in the coming decades;
- the impact of predicted global warming on the territory and on operating conditions of the hydro project, for example, increased precipitation associated with some climate change predictions could increase spillway use, exsion, etc.
- modified ice conditions related to climate change could further modify conditions in Manitounuk Sound.
- of major hydroelectric projects, existing and under study, on coastal ecosystems, particularly on ice regimes and marine currents in the James and Hudson Bay bio-region;
- of major hydroelectric projects, existing and under study, on the Inuit of the Belcher Islands, particularly with relation to the lifestyle and subsistence of the inhabitants of Sankikiluaq;
- related to seismic risk of opening the area and the seismicity caused by impoundment of reservoirs (La Grande, Great Whale, NBR, etc).

5.14.0 Synthesis and evaluation of impacts

The Proponent shall present an overview of the anticipated impacts for each variant and sub-variant of the project components, in order to facilitate analysis of all the impacts.

For each variant, the Proponent shall present a synthesis on the impacts of the biophysical and social environments.

Furthermore, the Proponent shall present an integrated synthesis of the project's repercussions on the biophysical environment in the study area, including the cumulative impacts on Hudson Bay and the Belcher Islands. The same procedure should be undertaken for the social environment. This is intended to clarify the project's impacts by placing them in an overall perspective based on sustainable development. The Proponent shall try to present a realistic portrait of changes to the environment following completion of the Great Whale project. It shall also establish whether the sustainability and use of resources will be ensured for future generations.

6. MITIGATIVE MEASURES, RESIDUAL IMPACTS AND COMPENSATORY MEASURES

In this section, the Proponent shall present mitigative measures for accepted project variants and sub-variants and for all project components related to access and lodging infrastructures and the collector system. The Proponent shall also identify the nature and scope of the residual impacts which will take place in spite of these measures and propose, if need be, compensatory measures to alleviate the negative impacts of the project.

In this context, the Proponent shall refer to the experience acquired during the implementation of the La Grande Complex. The Proponent will evaluate the efficiency of the mitigative and compensatory measures for that project and measure the level of satisfaction of the affected population with regard to these measures. The Proponent should also refer to similar projects in northern environments, as well as to the available relevant literature in order to demonstrate that the mitigative and compensatory measures proposed are a true reflection of the state of the art in this field.

In the case of the La Grande complex, mitigative measures were often taken after the discovery of environmental problems. This situation occured where insufficient knowledge with regard to impact prediction restricted the identification of adequate mitigative and compensatory measures. For the Great Whale project, the Proponent shall develop a plan for mitigative and compensatory measures prior to the onset of construction that would be implemented during the proposed construction and operation phases of the complex.

The Proponent will consult with the Native population in order to ascertain their needs with regard to developing mitigative and compensatory measures for the proposed project. These consultations shall take into account the concerns expressed by the Native populations concerning modifications, in time and in space, to traditional aboriginal practices and will lead to a concrete mitigation and compensation program for these impacts.

6.1.0 Mitigative measures

The objective of mitigative measures is to diminish or alleviate the project's negative environmental impacts. To this end, the Proponent shall present all the work proposed during the construction phase of the complex, the access infrastructures and the collector system, the preventative and corrective measures as well as the specific actions proposed.

The Proponent shall present the costs, timing and mode of implementation of these mitigative measures, indicating who will be responsible for their implementation and identifying the legal obligations of the contractors and sub-contractors responsible for those measures. The Proponent shall also assess the possibility of setting up an organization like the SOTRAC (La Grande '75) to that end.

The review of mitigative measures by the Proponent shall deal with, but not be limited to, the following aspects:

- management and control of water levels in rivers where flows are to decrease so as to maintain stability in the ecosystems;
- evaluation of the ecological benefits associated with various options for maintaining residual flow in diverted rivers;
- measures designed to alleviate anticipated impacts on the spawning beds and winter habitats of anadromous fish in the Great Whale, Boutin and Little Whale River estuaries;
- measures aimed at regulating or mitigating the effects of backflow and flooding along banks in areas where flows are to increase, including a review of erosion control measures.
- the use of dikes or dredging to restrict flooding in sectors of interest;
- formulation of a reservoir management policy designed to ensure the protection, diversity and productivity of fish stocks in the reservoirs. To this end, the Proponent shall discuss links between reservoir design and operation criteria on the one hand and fish community structures and reproductive strategies on the other. The Proponent's analysis shall include a clear description of the constraints inherent in managing reservoirs and containment bays as well as an explanation of the unknown factors that should be taken into consideration in developing these strategies;
- presentation of the impoundment schedule, including the leeway inherent in such a schedule, and possible environmental benefit in each case;
- deforestation of flooded sectors for purposes of aesthetics or wildlife management and/or the removal of wood residue after impoundment;
- clean-up of sectors that could be flooded and which include waste items (for ex.: barrels) that could pose a threat to the environment;

- formulation of methods for implementing an intensive harvest program prior to filling the reservoirs and forebays upstream to enable the recovery or relocation of wildlife;

- a comparative and detailed assessment of mitigative strategies to control the production of methylmercury and its bio-accumulation in fish;

- development of spawning beds, taking into account reservoir operations and the various species concerned. The design and location criteria must be specified;

- control of water levels surrounding the reservoirs, especially in the Lake Bienville area, via containment measures and the evaluation of areas where waterfowl and, as warranted, other resources are vulnerable to this type of development;

- implementation of measures to control fish migration;

- periods when construction must be interrupted in order to protect fish spawning, waterfowl migration or caribou mating etc.;

- the various methods available for restoring and redeveloping sites which were stripped or otherwise disturbed by construction activities;

- replacement of the drinking water source for Kuujjuarapik/Whapmagoostui. The Proponent shall present the alternatives in this respect and indicate the advantages and disadvantages of each one while describing the work required the environmental impact. The Proponent shall also indicate the form of its participation in implemention of that measure in order to guarantee that the community will have a viable source of potable water to satisfy the current and future needs of the community;

- the possibility of maintaining rivers, lakes and reservoirs as traditional transportation routes for Native people, both in the summer and winter. The Proponent shall identify the rivers or river sections and the reservoirs or reservoir sectors which would become unsuitable for hunting, trapping and fishing travel, due to a lack of water flow. The Proponent shall also indicate how it intends to maintain the movement of individuals to enable access to their hunting territories;

- specific measures (spillway operation, condition of ice-cover) that ensure that Native hunting, fishing and trapping activities will be maintained safely;

- if temporary roads prove necessary, the Proponent shall indicate the renaturalization modes selected and, if necessary, the restoration measures considered for watercourses. Also, it shall indicate the decommissioning measures for these roads and other infrastructures and the restoration of the affected waterways;

- the replacement of access routes for fishing, hunting and trapping during construction phases when access will be restricted;
- the administrative status of permanent roads, once construction is completed. The Proponent shall indicate which department or organism will maintain these roads and control access to the territory through them;
- the possibility of adjusting work periods to accommodate traditional hunting activities, especially in Manitounuk Sound;
- identification and relocation of burial grounds that would be disturbed, in consultation with the communities concerned;
- the aesthetic, recreative, fishing and hunting enhancement of areas affected or not by construction work;
- the preservation of archaeological sites and the means to properly use the results of various studies.
- identification of the most appropriate social intervention strategy for mercury contamination and the resources required for the implementation and periodic evaluation;
- the total or partial loss, for Cree and Inuit trappers, of their hunting territories and the possible compensatory measures to be implemented;
- the measures required to minimize repercussions on Category I and II land;
- the development of popular education programs to heighten Native people's awareness of the project's impacts, the social changes that it may bring, and the mitigative measures that may be taken in order to minimize the biophysical, technical, social and economic impacts;
- the Proponent's obligations for the planing process of the attenuation measures, evaluation of these measures, their implementation and those responsible in the affected communities;

- long-term responsibility for the implementation of the mitigative measures should a project infrastructure or other type of equipment cease to be under the Proponent's control.

In the context of local and regional economic spinoffs, the Proponent shall describe employment opportunities for Native people and policies that will be adopted for participation of Native companies in construction work. The Proponent shall define which type of construction activity is suited to contractual arrangements with Native contractors, and provide a list of jobs and contracts which will be available to Natives.

The Proponent shall also review the La Grande experience (during construction and operation) and highlight the effective participation of Natives in construction work and the value and interest of training programs designed to develop local manpower for the long-term jobs created. The Proponent shall take into account the reports prepared by the James Bay Employers Association in this respect.

The Proponent shall discuss the problems resulting from the use of French in the workplace and the constraints inherent in construction jobs with respect to hiring Native people. The Proponent will also present the politics of the entreprise and affiliates in respect to hiring, professional training of the Native workers.

6.2.0 Residual impacts

Residual impacts are those for which no mitigative measures can be established or that remain even after implementation of mitigative measures, including the environmental impacts of such major installations as dams and dikes which modify the natural environment for many centuries.

The Proponent shall identify the nature and scope of all residual impacts of the project, both for the construction and operation phase of the complex, referring to the same criteria used to identify the original impacts in order to facilitate comparison between the two groups of impacts. The Proponent shall present residual impacts in the form of an overview that will enable compensatory measures to be identified.

6.3.0 Compensatory measures

The Proponent shall present measures designed to compensate the residual negative impacts of the project, describing the actions that will be undertaken, indicating the groups, organisms or individual users targeted by these measures, the sums of money considered and the implementation schedule for these compensatory measures. The

Proponent shall also present a summary of compensatory measures established for the La Grande project and the level of satisfaction realized by the targeting groups.

There is often a fine line between mitigative and compensatory measures. Some mitigative measures identified above may also be described as compensatory measures. It shall be the Proponent's responsibility to distinguish between them in the presentation of the EIS.

7. ENVIRONMENTAL MONITORING AND FOLLOW-UP PROGRAMS

Monitoring efforts will focus on gathering knowledge on the evolution of the study area for the general purposes of verifying predicted impacts and supporting sound project management. In a broader sense, the monitoring regime must contribute to improved decision making, remedial measures and long-term planning and management of the region.

Monitoring and follow-up measures shall also provide processes and mechanisms to deal with anticipated and unforeseen impacts of the project. "Follow-up" shall signify the range of specific remedial actions undertaken by the Proponent in response to information gained in the course of monitoring. The Proponent shall indicate the agencies and bodies which will be charged with the monitoring and follow-up mechanisms. Ideally, the implementation of monitoring and follow-up programmes will be independent of the Proponent.

Moreover, the Proponent shall ensure participation of the concerned public, notably the Inuit and the Cree, in the mechanisms implemented in order to facilitate diffusion of information collected through monitoring.

7.1.0 Environmental monitoring during construction

During project construction, the Proponent shall ensure environmental monitoring of the work, including the implementation of measures designed to regularly monitor construction activities affecting the environment. Plans for the monitoring program will also be developed for the operational phase of the project.

In its impact study, the Proponent shall specify:

- the environmental code to be applied;
- specific monitoring measures the Proponent plans to implement with respect to specific aspects of the project;
- contractors' obligations vis-à-vis environment-related provisions in their contracts;
- emergency intervention measures during and after construction;
- management procedures for hazardous products and waste;

- monitoring of activities involving the use of explosives including the control measures designed to ensure monitoring;
- measures aimed at developing or supervising sport hunting and fishing activities practised by on-site personnel;
- development of an operating monitoring policy (operating manual);
- submission of monitoring reports on a regular basis.

A major portion of the supervisory work with respect to the environment will involve adhering to the environmental authorizations that may be issued. The Proponent shall describe measures that will ensure that site personnel are well informed and duly accountable in this regard.

7.2.0 Environmental monitoring after construction

In the post-construction phase, environmental monitoring will be based on studies of changes to the environment created by the development of the proposed Great Whale Complex. The objectives of the post-construction monitoring program include the need to:

- compare actual changes to the environment with the changes anticipated in the EIS, and thus to seek a better understanding of the nature of impacts including those that cannot be mitigated;
- contribute to the study of cumulative impacts generated by major hydro-electric developments;
- supply information designed to help monitor new stabilized conditions established subsequent to environmental disturbance;
- compile the necessary data for planning and evaluating mitigation measures;
- complete the gathering of baseline data required to describe original environmental conditions and thus to help improve methods of anticipating the impacts of future development projects.

In this particular context, environmental monitoring includes the study of ecological conditions as well as various aspects of the social environment. The Proponent shall submit an assessment of the ecological monitoring performed for the first phase of the La Grande complex, including an evaluation of how the results of the latter were applied to the study of ecosystems altered by that development, and how the information produced was linked to action in terms of specific remedial or compensatory measures.

The La Grande complex ecosystem follow-up assessment will include:

- selection of the physico-chemical parameters to be used and the most pertinent bio-indicators;
- sampling and lab analysis constraints;
- constraints affecting biostatistical data;
- quality control over observations and their reproducibility;
- physical and chemical characteristics;
- phytoplankton, zooplankton and benthos;
- estimate of the phytoplankton biomass and primary production;
- fish;
- estuarine ecosystems where flows are to be decreased and/or increased;
- littoral ecosystems, including Manitounuk Strait;
- original and re-established riparian environments;
- avian species, including waterfowl and migratory birds;
- land and marine animals.

On the basis of this assessment, the Proponent shall propose an environmental follow-up program designed for the Great Whale fresh-water, marine and terrestrial ecosystems, with specific reference to the beluga whale and the fresh water seal. The data derived shall be used to detect and evaluate the impacts generated by development of this complex. This proposal should include a description and, where appropriate, explanations of the changes made to the methodology used for the La Grande complex follow-up program.

The Proponent shall outline the follow-up program required for mitigative measures applied to rivers where flows are to be decreased or increased (including an evaluation of the various strategies for maintaining controlled flows and spillway use), as well as the follow-up program to be implemented on proposed mitigation measures in estuarine environments.

With regard to monitoring of methylmercury associated with the proposed hydro-electric development, the Proponent shall include an analysis of the programs established in the first phase at the La Grande complex and a discussion of those aspects which should be re-evaluated in planning the program for the Great Whale complex.

The analysis will cover the first four aspects of the above list for the follow-up program and assess the advisability of continuing to analyse inorganic and organic mercury in aquatic systems affected by the proposed development. The Proponent will also indicate how the control ecosystem for this follow-up study will be determined.

The Proponent shall present a strategic follow-up program covering the following aspects of the social environment:

- the evolution of hunting, fishing and trapping activities and sustainable harvest levels;
- support programs for activities related to the use of wildlife resources;
- the economic structure of the villages concerned;
- the economic spinoffs generated by the project, including programs for workforce training, the provision of employment, and the support of Native businesses;
- public health, including social and cultural aspects of the increased incidence of methylmercury in the environment;
- the gathering of information on the cultural importance of flooded sites to the Cree and Inuit;
- follow-up on preservation operations and attempts to gain a better overall understanding of archaeological resources.

With regard to the ecological and socio-cultural aspects of the follow-up program, the Proponent shall establish public review and feedback mechanisms designed to facilitate the involvement of Native communities and their regional authorities as well as the Quebec Department of the Environment.

The Proponent shall outline how the proposed follow-up programs will be flexible enough to permit adjustments as new information comes to light, avoiding methodologies that are too rigid to modify on the basis of ongoing experience.

7.3.0 Decommissioning

The Proponent shall discuss the long term management of the project and its components, identifying how the operation, utilization, development, possible rebuilding and, eventual dismantling of installations will be integrated with the needs of the Proponent, Native people and other users of the territory.

The Proponent shall indicate if some of the installations, including the access roads, may be used or recuperated for other purposes, by other Proponents or by the Native communities, or if they shall be definitely dismantled at the end of their useful life. The proposed means of restoration of the area shall also be presented.

7.4.0 Governance and long-term management

The Proponent will validate the conclusions reached in the impact assessment by ensuring that an appropriate institutional framework and protocol are created to implement the measures proposed in the Environmental Impact Statement (EIS). Monitoring will reveal the accuracy of impact prediction and the effectiveness of mitigative and compensatory measures. Long-term management will extend beyond this task to identify and respond to unforeseen impacts and those effects of the project which could not be predicted at the time of the EIS.

The promoter will demonstrate how the long-term management will be a dynamic, responsive, multi-actor and integrative process with the mandate, the ability and the resources to overcome shortcomings of monitoring and follow-up programs. In the EIS, the Proponent will indicate the frequency and the manner in which reports on the predictions contained in the impact study and a "State of the Affected Environment Report" will be prepared.

Long-term management of the proposed Great Whale Project is a process designed to address the environmental and social impacts which may arise, should construction of the proposed project occur. The proposed process will be organized with respect to the principles of sustainable and equitable development in the region. While the specific actions and actors involved in long-term management will only become clear over time, a protocol and an institutional framework must be proposed by the Proponent as part of the environmental impact statement (EIS). The system will show how a configuration of monitoring, control, follow-up, reporting, mitigation, compensation and other measures will combine to form a logical, effective and efficient way of managing the impacts of the project over the immediate, intermediate, and long term.

The Proponent must identify and consult with national, regional and local authorities and agencies which will have roles and responsibilities in the governance and long-term management of the region. The list of relevant authorities must extend beyond the Governments of Quebec and Canada to include appropriate Inuit and Cree organizations. The Proponent will propose a functional interim system that will operate for the first five years following the completion of the project's construction.

The Proponent will facilitate the transition to an operational long-term management system and retain responsibility and accountability as the coordinator of the system until the proposed project has become fully operational. The Proponent will describe how and when specific responsibilities will be transferred or devolved to appropriate authorities and agencies .

APPENDIX A

January 23, 1992 R1

MEMORANDUM OF UNDERSTANDING

(PROTOCOLE D'ACCORD)

ENVIRONMENTAL ASSESSMENT OF THE GREAT WHALE PROJECT

WHEREAS the Great Whale Project proposed by Hydro-Quebec will be assessed and reviewed pursuant to the environmental assessment and review processes provided for in Chapters 22 and 23 of the James Bay and Northern Quebec Agreement (JBNQA or the Agreement) and the federal Environmental Assessment and Review Process (EARP) Guidelines Order;

WHEREAS it is desirable to coordinate the various environmental assessment and review processes applicable to the Project so as to maximize their effectiveness and minimize duplication;

WHEREAS the purpose of the MOU is to apply the provisions of the Agreement and of the EARP Guidelines Order with a view to coordinating the environmental assessment and review processes described above;

WHEREAS it is opportune to reach an understanding on the matters contemplated herein;

WHEREAS the Governments of Quebec and of Canada agree to the proposed coordination;

WHEREAS the Cree Regional Authority and the Grand Council of the Crees (of Quebec) also agree to the proposed coordination;

WHEREAS Makivik Corporation and the Kativik Regional Government also agree to the proposed coordination;

NOW THEREFORE:

1. Review Processes

The various environmental assessment and review processes will be carried out in accordance with the provisions of Chapters 22 and 23 of the JBNQA, Chapter II of the Environment Quality Act, and the EARP Guidelines Order.

2. Global Review

The Great Whale Project, as defined in the Declaration of Settlement Out of Court, dated 25 October 1991, in the case Chief Robbie Dick et Al vs. Paradis et Al., will be assessed and reviewed globally as a single project.

3. Harmonization

The federal panels and the provincial committees and commission which are operating under the Agreement, and the federal panel which is operating under the EARP Guidelines Order, hereinafter collectively called the Committees, will coordinate and harmonize their activities and service requirements as follows:

3.1 Principles

i) Each committee, commission and panel operating under the Agreement will act as an independent entity and will comply with the provisions stipulated in the Agreement. The federal panel operating under the EARP Guidelines Order will act as an independent entity and will comply with the provisions thereof.

ii) The secretariats of the Committees will be maintained.

C. S

iii) Every effort will be made to avoid, whenever practicable, duplication and overlap, and to coordinate and harmonize the environmental assessment and review processes and technical support measures.

iv) The administration of all coordination measures or procedures should not in any way undermine the responsibilities and prerogatives of the different Committees.

v) The coordination and harmonization measures mentioned herein are in accordance with the principles of the Agreement and the EARP Guidelines Order, and shall in no way be considered to modify the Agreement. Moreover if, in the future, any final, unappealed judicial decision should determine that all or part of this MOU is a modification to the Agreement, then this MOU will automatically become void and without effect unless the part of this MOU that is ruled to be a modification of the Agreement can, in the opinion of the court, be severed without affecting substantially the remaining parts.

vi) The selection of funded participants and the administrative procedures related to participant funding shall remain distinct and separate from the Committees responsible for carrying out the environmental assessments and reviews in accordance with the Agreement and the EARP Guidelines Order.

vii) It is understood that the federal and provincial governments will share equally the costs of joint services, the joint support team and related organizational requirements.

3.2 Objectives

The Committees, while maintaining their independence and autonomy, and when appropriate within their respective jurisdictions, will work together with a view to:

i) holding joint public meetings and public hearings;
ii) consulting each other on the preparation of guidelines for the Environmental Impact Statement (EIS) with a view to their coordination;
iii) coordinating their requirements for technical expertise and administrative and logistical support;
iv) coordinating their schedules and rules of procedure.

3.3 Coordination Meetings

The Committees will delegate their Chairman and/or their members to arrange the coordination with other Committees. The delegates of the Committees will meet informally on an as required basis to discuss matters of mutual interest or concern, and to develop a joint approach to processes and services whenever possible.

3.4 Joint Services and Joint Support Team (Bureau de soutien commun)

A joint support team will be created as soon as practicable with a mandate to provide services to the Committees in the following areas:

- Scientific and technical expertise
- Public information
- Organization and logistics of public meetings and hearings
- Documentation
- Translation and interpretation
- Administration and finance

The joint support team will be responsible to the Committees. It will be staffed and resourced to provide the services mentioned above, and will arrange for outside expertise and analysis, as specified by the Committees. The parties will take steps so that senior staff members of the joint support team will include at least one individual to be recommended by each of the Cree Regional Authority and Makivik Corporation.

The work tasks required from the team will be defined by the Committees. When practicable, the work tasks will be required on a joint basis. However, other work tasks may be required directly by individual Committees in instances where a joint approach is unnecessary or impracticable. In this regard, it is agreed that the Committees would keep each other informed of such individual requirements submitted to the support team.

The support team will be managed by two coordinators, each accountable for discrete areas of service:

- a scientific coordinator will be responsible to the Committees for all scientific and technical expertise required by the Committees;

- an administrative coordinator will be responsible to the Committees for public information, organization and logistics of public meetings and hearings, documentation, translation and interpretation, administration and finance.

The support team will be assisted by officials appointed by the Federal Environmental Assessment Review Office (FEARO) and by the ministère de l'Environnement du Québec (MENVIQ). These officials will channel the financial resources made available by their respective governments for the purpose of the reviews in accordance with the priorities established by the Committees for the joint support team. Upon request by the Committees or the coordinators, they will also provide operational advice and engage in problem solving. They will also provide requisite financial authorizations.

The joint support team will maintain offices in Montreal and in Kuujjuaraapik-Whapmagoostui.

4. Language of Documentation and Information

Key documents and information of the proponent and the Committees, as identified by the Committees, shall be made available in French and English. Such documents, or summaries thereof, shall, when appropriate and practicable, be made available in Cree and Inuktituut. It is recognized however, that not all documents will be available in the four languages. The joint support team will, when appropriate, coordinate translation work with Hydro-Quebec.

5. Project Justification

Concerning justification of the Project, the parties refer to **Annex 1**, and agree that the items listed therein be considered by the Committees or the Administrators in their recommendations or decisions concerning the guidelines as to the content of the EIS.

6. Review Process Schedule

The Committees shall propose the planned schedules for the assessment and review processes. It is recognized by the parties that it would be appropriate for the time limits stipulated in the Agreement to be extended to allow adequate time for the review of this large Project. The Administrators named pursuant to the Agreement retain their authority thereunder to determine the period of extension.

The schedules of the assessment and review processes will accommodate the various steps contemplated by the Agreement and the EARP Guidelines Order, including: the Project definition, the preparation of guidelines, public meetings prior to the issuance of the guidelines, the issuance of guidelines, the preparation of an EIS, the review of the quality of the EIS, the analysis of the EIS, and public hearings on the Project, focussing on the EIS, prior to the completion of recommendations or decisions of the Committees.

7. Public Meetings and Hearings

The parties agree that it would be appropriate for public meetings and hearings to be held on:

a) the scoping of the issues to be addressed in the guidelines for the preparation of the EIS on the Project;

b) the review of the Project, focussing on the EIS submitted by Hydro-Quebec.

8. Participant Funding

A fund of $ 2,000,000 will be available to assist eligible participants in the assessment and review processes in relation to the Project, financed equally by the Governments of Canada and Quebec. The provision of funding to participants from this fund will not be affected by the provision of funding to participants from other sources.

Requests for funding from this fund will be reviewed by a specific participant funding committee established as soon as practicable and composed of five persons appointed jointly by the governments. The parties will take steps so that one person will be appointed from nominations submitted by the Cree Regional Authority, and one person will be appointed from nominations submitted by Makivik Corporation.

The Governments of Quebec and Canada undertake to disburse the fund after receiving the recommendations of the participant funding committee which shall make such recommendations relative to the distribution thereof based on the guidelines to be established by the governments. These guidelines will be based on the FEARO Participant Funding Program as-adapted to the Great Whale Project. Such guidelines will provide, in particular, that requests from persons and groups living in the territory most directly impacted by the Project, or their representatives, will be considered in priority, and may be submitted in comprehensive form on behalf of several persons or groups in compliance with the adapted guidelines. The parties agree that two-thirds of the funds will be allocated to these directly impacted persons or groups living in the territory or their representatives.

The provision of funding under this article shall not prevent any participant from seeking and obtaining funds from other sources.

9. Without Prejudice

This MOU applies only to the Great Whale Project.

This MOU is entered into without prejudice to and under reserve of the rights, claims and recourses of the parties hereto, the legal proceedings mentioned in Annex II hereof and the positions of the parties in such legal proceedings.

In particular, this MOU shall not affect any rights and recourses under the Agreement. Further, this MOU shall not be interpreted as creating new rights under the Agreement or extinguishing or diminishing rights under the Agreement. In case of a conflict or inconsistency between the Agreement and this MOU, the Agreement shall prevail to the extent of such conflict or inconsistency.

Should any final, unappealed judicial decision determine that one or more assessment and review processes contemplated herein do not apply in respect of the Project, then this MOU would continue to be valid and in force except insofar as the application of that or these processes is concerned.

C.S.

10. Final Provisions

It is the understanding of the parties that this MOU shall bind them as a contract.

The parties may meet, consult and exchange views regarding the implementation of this MOU.

This MOU is duly executed in Montreal, Quebec, this 23rd day of January, 1992, by:

Jean J. Charest C.P., M.P.

The Government of Canada

The Government of Quebec

The Cree Regional Authority

Makivik Corporation

Kativik Regional Government

Matthew Coon Come

The Grand Council of the Crees (of Quebec)

The following interveners agree to the provisions of this MOU that concern them:

The Evaluating Committee (Chapter 22 of the Agreement)

The Review Committee (Chapter 22 of the Agreement)

The Federal Review Panel (Chapter 22 of the Agreement)

The Kativik Environmental Quality Commission (Chapter 23 of the Agreement)

The Federal Review Panel (Chapter 23 of the Agreement)

The EARP Environmental Assessment Panel

PROJECT JUSTIFICATION

I. DEMAND

- ■ Load forecasting (peak power and energy)
  - Industrial sector
  - Commercial sector
  - Residential sector

- ■ Exports
  - Policy and objective
  - Economic analysis

- ■ Demand Side Management and Conservation
  - Objective
  - Economic analysis
  - Load management

-
  - Influence of energy policy in load forecasting
  - Global economic analysis of the industrial sector
  - No analysis of specific industrial or export contracts
  - Effect of future risk-sharing contracts

II SOLUTIONS

Comparison between the following categories and within these categories when appropriate:

- Hydroelectricity
- Thermal (fossil)
- Nuclear
- Purchase (including import)
- Cogeneration
- New technologies

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III SYSTEM PLANNING

- Reserves
- Losses
- Hydro operations
- Critical assumptions : reliability criteria

IV EQUIPMENT PROGRAM

- results of integration of different parameters = scenarios
- classification of projects (base and peak)
- cost comparison

V DESIGN ALTERNATIVES

- Parameters related to the nature of demand
  - capacity
  - reservoir size
  - capacity factor

- Project variants (including non diversion of Little Whale River)
  - engineering design
  - costs

VI FINANCIAL PROFORMA AND RATES ANALYSIS

- Review of financial parameters
- Review of rate design
- Analysis of different scenarios

NOTE: In addition, the EIS will address sociological factors or impacts.

ANNEX II

LIST OF CASES

- Grand Chief Matthew Coon Come et al vs Canada et al: Federal Court of Canada no T-962-89 and any appeals.

- Grand Chief Matthew Coon Come et al vs Hydro Quebec et al: Superior Court of Quebec no CSM-500-05-004330-906 and any appeals.

- Robinson et al vs Cree Regional Authority et al: Federal Court of Canada - Appeal Division and any appeals.

- Grand Council of the Cree (of Quebec) et al vs Hydro Quebec et al and the National Energy Board et al: Supreme Court of Canada and subsequent appeal if leave to appeal is granted.

- Eastmain Band et al vs Robinson et al: Federal Court of Canada and any appeals.

- All proceedings brought by the Grand Council of the Crees (of Quebec) before the Quebec Access to Information Commission and subsequent appeals and\or evocations.

LETTRES D'HYDRO-QUEBEC

SIGNEES LE MEME JOUR QUE LE PROTOCOLE D'ACCORD

DU 23 JANVIER 1992 RELATIVEMENT A L'

EVALUATION ENVIRONNEMENTALE DU PROJET GRANDE BALEINE

HYDRO QUEBEC LETTERS

SIGNED THE SAME DAY AS THE MEMORANDUM OF UNDERSTANDING

OF THE 23RD OF JANUARY 1992 CONCERNING THE

ENVIRONMENTAL ASSESSMENT OF THE GREAT WHALE PROJECT

JANUARY 1992
JANVIER 1992

Hydro-Québec
75, boul. René-Lévesque ouest
Montréal (Québec)
H2Z 1A4

January 23, 1992

Cree Regional Authority

Makivik Corporation

RE: Support funding for the James Bay Crees and for the Inuit of Quebec

Dear Sirs:

The purpose of this letter is to take measures which will permit the Crees and the Inuit to have additional financial resources in order to carry out their activities as participants in the environmental assessment and review processes relating to the Great Whale Project pursuant to the Memorandum of Understanding (MOU) executed today between the Cree Regional Authority, Makivik Corporation, the Kativik Regional Government, the Grand Council of the Crees (of Quebec) and the Governments of Canada and Québec.

For this purpose, Hydro-Québec shall establish a fund in the amount of $3,000,000 for the James Bay Crees and the Inuit of Quebec. This fund shall be divided equally between the Cree Regional Authority and Makivik Corporation, that is, $1,500,000 for each entity. These amounts will be paid by Hydro-Québec to the Cree Regional Authority and to Makivik Corporation. For the period during which the guidelines are being prepared, each will be advanced an amount of $300,000, which advance shall be paid within fifteen (15) days of the signature by the parties of the MOU.

Immediately after the issuance by the competent authorities of the guidelines for the environmental impact statement, an additional advance of $300,000 will be paid to each entity.

As to the balance of $1,800,000, it will be paid in equal shares to the Cree Regional Authority and to Makivik Corporation in maximum trimestriel payments of $300,000 each, starting three months after the issuance of the guidelines and in accordance with the schedules and budgetary projections prepared by the Cree Regional Authority and Makivik Corporation, each for itself, and subject to the following conditions:

a) If the amount of $300,000 for the preceding period has not been spent in its entirety, the next payment will be for a maximum amount of $300,000 plus the balances of the amounts of $300,000 which have not been spent during the preceding periods, in accordance with the said schedules and budgetary projections.

b) If one or more expenses submitted by one or the other entity have not been accepted by the joint support team, Hydro-Québec shall be authorized to deduct such expenses from the next payment of $300,000.

c) Any balance of this fund of $3,000,000 which shall not have been paid by Hydro-Québec will be paid upon acceptance by the joint support team of expenses.

Hydro-Québec undertakes to negotiate with the joint support team an administrative agreement, acceptable to the Cree Regional Authority and Makivik Corporation, conferring upon it the function of verifying the eligibility of expenses for the fund.

Starting one month after the conclusion of the MOU signed today, the Cree Regional Authority and Makivik Corporation undertake to submit each month a monthly statement of their expenses and supporting vouchers to the joint support team, with a copy to Hydro-Québec.

This provision of funds, to a maximum amount of $3,000,000, must be used for the payment of costs actually incurred for purposes of the environmental assessment and review processes contemplated in the MOU signed today. These costs include, for example, fees of technical experts, native representatives, legal advisors and other professionals as selected by the participants; salaries and wages, including fringe benefits and administrative expenses; travel expenses (air and land) and subsistence expenses; costs of studies, expertises, analyses and data collection; and support expenses, including purchase or rental of equipment and supplies, rental of space, telephone, telecopier, translation, delivery, postage, stenography, meetings and conferences, and others.

The decision of the joint support team as to the eligibility of expenses as described in the preceding paragraph is final and without appeal.

It is understood that the dates of payment contemplated in this letter have no bearing on the schedule for the environmental assessment and review processes relating to the Great Whale Project.

HYDRO-QUEBEC

By: ______________________
Assistant Secretary

Accepted:

____
Cree Regional Authority

____
Makivik Corporation

Note: This text is a translation.
The original letter is in French.

Hydro-Québec
75, boul René-Lévesque ouest
Montréal (Québec)
H2Z 1A4

23 January 1992

CREE REGIONAL AUTHORITY
MAKIVIK CORPORATION
GRAND COUNCIL OF THE CREES (OF QUEBEC)
KATIVIK REGIONAL GOVERNMENT

Re: Great Whale Project - Technical Information Exchange Group

Dear Sirs:

The meeting of 15 January 1992 held in the offices of Hydro-Québec's Environment Vice Presidency concerning the justification of the Great Whale Project and attended by, among others, experts for the Crees, the Inuit and Hydro-Québec, was judged very productive by Hydro-Québec.

Hydro-Québec therefore accepts to participate in the establishment of a technical information exchange group composed of representatives of Hydro-Québec, Makivik Corporation, the Kativik Regional Government, the Grand Council of the Crees (of Quebec) and the Cree Regional Authority. This group will be presided over by a person independent of the parties mentioned above and appointed jointly by them. This group would constitute a preferential forum for the exchange among its members of technical information and pertinent documents concerning the justification of the Great Whale Project, as described in the declaration of settlement out of court dated 25 October 1991 in the case Dick et al. v. Paradis et al., within the framework of the applicable assessment and review processes.

If, during meetings of the group, disputes arose among the members as to the provision of certain documents and technical information which the representatives of the native parties wished to obtain, the chairman would make known his opinion on the subject but this opinion would not bind Hydro-Québec, which might still refuse to provide them.

This group would be established immediately after the conclusion of the Memorandum of Understanding signed this day, but it is understood that meetings will commence as soon as possible after the issuance of the guidelines by the competent authorities under the James Bay and Northern Quebec Agreement and the federal Environmental Assessment and Review Process.

It is understood that the members do not intend by the creation of this technical information exchange group to substitute themselves in any way for the Committees, the Commission and the Panels created under the James Bay and Northern Quebec Agreement and applicable laws or under the EARP Guidelines Order.

The independence and autonomy of these Committees, Commission and Panels is fully recognized.

The Joint Support Team and the Committees, Commission and Panels may request and obtain the documents furnished by Hydro-Québec concerning the Project during meetings of the group.

The operation of this group shall not prejudice the right of these Committees, the Commission and the Panels and of the parties mentioned in this letter to request documents and information concerning the Project for the purposes of the applicable assessment and review processes, or otherwise.

HYDRO-QUEBEC

Per: Yves Ménard, Assistant Secretary

Accepted:

CREE REGIONAL AUTHORITY

MAKIVIK CORPORATION

GRAND COUNCIL OF THE CREES (OF QUEBEC)

KATIVIK REGIONAL GOVERNMENT

FOR SIGNATURES,
SEE ORIGINAL LETTER
IN FRENCH

c.c. - Government of Quebec (for information only)
- Government of Canada (for information only)

Note: This text is a translation.
The original letter is in French.

Hydro-Québec
75, boul René-Lévesque ouest
Montréal (Québec)
H2Z 1A4

January 23, 1992

Cree Regional Authority
Makivik Corporation
Grand Council of the Crees (of Quebec)
Kativik Regional Government

SUBJECT: Great Whale Project

Sirs:

Hydro-Quebec has taken cognizance of the Memorandum Of Understanding (MOU) signed by the parties on January 23, 1992, a copy of which is annexed hereto and does not object to it.

Hydro-Quebec confirms that at least the topics mentioned in Annex I of the MOU will be covered in its Environmental Impact Statement or Statements as may be required by the guidelines to be issued by the Federal Panels or the Administrators.

HYDRO-QUEBEC

By: ______________________
Assistant Secretary

ACCEPTED:

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Cree Regional Authority

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Makivik Corporation

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Grand Council of the Crees (of Quebec)

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Kativik Regional Government